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Agence de réglementation de la lutte antiparasitaire

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PROPOSED REGISTRATION DECISION

Thiaclopride

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FOREWORD

Proposed Decision for Thiacloprid

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act*, is proposing full registration for the sale and use of the technical grade active ingredient thiacloprid and the end-use product Calypso 480 SC Insecticide to control a variety of insect pests on pome fruit.

Current scientific data from the applicant, scientific reports and information from other regulatory agencies were evaluated to determine if, under the proposed conditions of use, the end-use product has value and does not present an unacceptable risk to human health or the environment.

This Proposed Registration Decision is a consultation document[1] that summarizes the science evaluation for thiacloprid and the reasons for the decision. It also describes risk-reduction measures that will be required to further protect human health and the environment.

The information is presented in two parts: The Overview describes the regulatory process and key points of the evaluation, while the Science Evaluation provides detailed technical information on the human health, environmental and value assessment of thiacloprid.

The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information indicated on the cover page of this document).

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[1] "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act* 2002

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OVERVIEW

Proposed Registration Decision for Thiacloprid

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act*, is proposing full registration for the sale and use of the technical grade active ingredient thiacloprid and the end-use product Calypso 480 SC Insecticide to control a variety of insect pests on pome fruit.

An evaluation of available scientific information found that, under the approved conditions of use, the end-use product has value and does not present an unacceptable risk to human health or the environment.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its conditions or proposed conditions of registration[2]. The Act also requires that products have value[3] when used according to label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

Rigorous and modern hazard and risk assessment methods and policies are applied to reach decisions. These methods consider the unique characteristics of sensitive subpopulations in both humans (e.g., children) and organisms in the environment (e.g., those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties present when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the PMRA's website at www.pmra-arla.gc.ca.

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[2] "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act* 2002

[3] "Value" as defined by subsection 2(1) of the *Pest Control Products Act* 2002: "...the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (a) efficacy; (b) effect on host organisms in connection with which it is intended to be used; and (c) health, safety and environmental benefits and social and economic impact".

Before making a registration decision on thiacloprid, all comments received from the public in response to this consultation document[4] will be considered. Afterwards, a Registration Decision document[5] on thiacloprid will be published that will include the decision, the reasons for it, a summary of comments received on the proposed registration decision and the PMRA's response to these comments.

For more details on the information presented in this overview, please refer to the Science Evaluation section of this consultation document.

What is Thiacloprid?

Thiacloprid is neonicotinoid insecticide with locally systemic and translaminar characteristics, i.e., penetrates the leaf tissues and forms a reservoir of active ingredient within the leaf. It is applied to pome fruit using ground application equipment to control a variety of insect pests. Thiacloprid acts as an agonist of the nicotinic acetylcholine receptor in the central nervous system, thus disturbing synaptic signal transmissions.

❖ Health Considerations

♦ Can Approved Uses of Thiacloprid Affect Human Health?

Thiacloprid is unlikely to affect your health when used according to the label directions.

Exposure to thiacloprid may occur through diet (food and water), when handling or applying the product, or when picking apples. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (e.g., children and nursing mothers).

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose where no effects are observed. The health effects noted in animals occur at doses more than 100-times higher (and often much higher) than levels to which humans are normally exposed when using thiacloprid products according to label directions.

Both the technical grade active ingredient thiacloprid and the end-use product Calypso 480 SC had health effects in animals when ingested and are considered to be potential skin sensitizers. Because of this, the label statements "Danger Poison" and "Potential Skin Sensitizer" are required, as well as the skull and crossbones symbol. Health effects in animals given daily doses of thiacloprid over long periods of time included effects on the liver, thyroid gland, adrenal gland, testes and prostate gland. When thiacloprid was given to pregnant animals, effects on the developing fetus were observed at doses that were toxic to the mother, indicating that the fetus is not more sensitive to thiacloprid than the adult animal. Effects on reproduction were seen at doses that were highly toxic to adult animals. Thiacloprid was not genotoxic, but did cause cancer in animals. The risk assessment is conducted to ensure that the level of human exposure is well below the lowest dose at which these effects occurred in animal tests. Only those uses for which exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

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[4] "Consultation statement" as required by subsection 28(2) of *Pest Control Products Act* 2002

[5] "Decision statement" as required by subsection 28(5) of *Pest Control Products Act* 2002

There were also no indications that thiacloprid caused damage to the nervous system of adult animals, but signs of a structural change in the brain were observed in developing animals exposed before and after birth. Because of this observation in brain tissue, extra protective measures were applied to the risk assessment to further reduce the allowable level of human exposure to thiacloprid.

♦ Residues in Water and Food

Dietary risks from food and water are not of concern.

Aggregate dietary intake estimates (food and water) revealed that the general population and infants, the subpopulation that would ingest the most thiacloprid relative to body weight, are expected to be exposed to less than 6.2% of the acceptable daily intake. Based on these estimates, the chronic dietary risk from thiacloprid is not of concern for all population subgroups. The lifetime cancer risk from the use of thiacloprid on pome fruit is considered acceptable.

A single dose of thiacloprid is not likely to cause acute health effects in the general population (including infants and children). An aggregate (food and water) dietary intake estimate for the highest exposed population (infants) was about 50% of the acute reference dose, which is not a health concern.

The *Food and Drugs Act* prohibits the sale of food containing a pesticide residue that exceeds the established maximum residue limit (MRL). Pesticide MRLs are established for the *Food and Drugs Act* purposes through the evaluation of scientific data under the *Pest Control Products Act*. Each MRL value defines the maximum concentration in parts per million (ppm) of a pesticide allowed in/on certain foods. Food containing a pesticide residue that does not exceed the established MRL does not pose an unacceptable health risk.

Residue trials conducted throughout Canada and the United States using end-use products containing thiacloprid on apples and pears were sufficient to propose MRLs for pome fruit or processed food derived from pome fruit. These MRLs can be found in the Science Evaluation section of this consultation document.

Risks in Residential and Other Non-Occupational Environments

- **Non-occupational risks are not of concern provided that directions specified on the label are observed.**

The risk to people who are exposed to thiacloprid both through diet or while picking apples at pick-your-own commercial operations has been assessed and is not of concern.

For bystanders, exposure is expected to be much less than that of field workers and is considered negligible. Therefore, health risks to bystanders are not of concern.

Occupational Risks From Handling Calypso 480 SC

- **Occupational risks are not of concern when Calypso 480 SC is used according to the proposed label directions, which include protective measures.**

Pesticide applicators mixing, loading or applying Calypso 480 SC and field workers entering freshly treated fields can come in direct contact with thiacloprid on the skin or through inhalation of spray mists. For this reason, the label will specify that anyone mixing or loading Calypso 480 SC must wear a long-sleeved shirt, long pants, chemical-resistant gloves and boots, and that anyone applying Calypso 480 SC must wear a long-sleeved shirt, long pants and boots. Taking into consideration these label requirements and that occupational exposure is expected to be limited as this insecticide is applied up to three times per season, risk to pesticide applicators and workers is not a concern.

Environmental Considerations

What Happens When Thiacloprid is Introduced Into the Environment?

Thiacloprid is toxic to beneficial arthropods such as predatory and parasitoid insects; therefore, label instructions are required to protect these organisms during pesticide application. Thiacloprid is also toxic to freshwater and marine invertebrates; therefore, buffer zones are required during application.

Thiacloprid enters the environment when used as an insecticide on pome fruit trees. Thiacloprid is not persistent in soil and is slightly persistent to persistent in water. The major transformation products formed in the soil are moderately persistent to persistent in this medium. The major transformation product formed in water is moderately persistent. Neither thiacloprid nor its major transformation products are expected to leach through the soil profile beyond 30 cm; therefore, they are not expected to enter groundwater. Based on its low volatility (vapour pressure and Henry's law constant), thiacloprid residues are not expected in the air.

Thiacloprid and its major transformation products present a low risk to wild mammals, birds, earthworms, bees, terrestrial plants, fish, amphibians, algae and aquatic plants. However, given that thiacloprid is an insecticide, it is expected to adversely affect terrestrial insects other than bees, as well as insects living in freshwater habitats in adjacent areas. It is also expected to adversely affect other freshwater and marine invertebrates. Therefore, specific instructions to reduce spray drift to terrestrial insects are provided on the product label. Also, buffer zones of 5 to 30 metres (depending on timing of application) are required to protect nearby freshwater and estuarine/marine habitats from the effects of spray drift.

❖ Value Considerations

♦ What is the Value of Thiacloprid?

Thiacloprid, a neonicotinoid insecticide, controls a variety of insects in pome fruit.

A single application of Calypso 480 SC Insecticide provides effective control of a range of insect pests on pome fruit (apple, pear, crab apple, Oriental pear, quince, loquat and mayhaw). It is also compatible with current management practices and conventional crop production systems. Growers are familiar with monitoring techniques to determine if and when applications are needed.

Other insecticides from the same class as thiacloprid are currently registered for use on some crops in the pome fruit group; however, thiacloprid controls a broader range of pests and can be used on the entire crop group. Prudent use of insecticides in this class should be observed to prevent the development of resistance. When applied according to label directions, thiacloprid is effective at controlling spotted tentiform leafminer, plum curculio, mullein bug, leafhoppers, codling moth, oriental fruit moth and apple maggot on pome fruit.

Measures to Minimize Risk

Registered pesticide product labels include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions are required by law to be followed.

The key risk-reduction measures being proposed on the label of Calypso 480 SC Insecticide to address the potential risks identified in this assessment are as follows:

Key Risk-Reduction Measures

- **Human Health**

Because there is a concern with users having direct skin contact with Calypso 480 SC, individuals must wear a long-sleeved shirt, long pants, chemical-resistant gloves and boots during mixing, loading, clean-up and repair activities. Applicators must wear a long-sleeved shirt, long pants and boots.

- **Environment**

Because Calypso 480 SC Insecticide is toxic to beneficial arthropods, exposure of these organisms to spray drift should be minimized. Specific instructions to reduce spray drift are provided on the product label.

Calypso 480 SC Insecticide cannot be sprayed within 5 to 30 metres of sensitive aquatic habitats. The distance allowed depends on the timing of application (early vs. late in the season).

Next Steps

Before making a registration decision on thiacloprid, all comments received from the public in response to this consultation document will be considered. Afterwards, a Registration Decision document will be published that will include the decision, the reasons for it, a summary of comments received on the proposed decision and the PMRA's response to these comments.

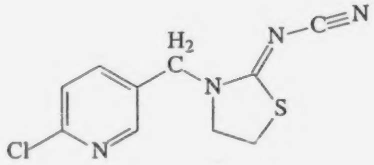
Other Information

At the time the PMRA makes its registration decision, it will publish an Evaluation Report on thiacloprid (based on the Science Evaluation section of this consultation document). In addition, the test data on which the decision is based will also be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa).

SCIENCE EVALUATION

1.0 The Active Substance, Its Properties and Uses

1.1 Identity of the Active Ingredient

Active substance	Thiacloprid
Function	Insecticide
Chemical name	
1. International Union of Pure and Applied Chemistry (IUPAC)	(Z)-3-(6-chloro-3-pyridylmethyl)-1,3-thiazolidin-2-ylidenecyanamide
2. Chemical Abstracts Service (CAS)	(Z)-[3-[(6-chloro-3-pyridinyl)methyl]-2-thiazolidinylidene]cyanamide
CAS number	111988-49-9
Molecular formula	$C_{10}H_9ClN_4S$
Molecular weight	252.7
Structural formula	
Purity of the active ingredient	98.5% nominal (limits 97.5–100.0%)

1.2 Physical and Chemical Properties of the Active Substances and End-Use Product

Technical Product—Thiacloprid Technical Insecticide

Property	Result
Colour and physical state	Yellowish crystal powder
Odour	No characteristic odour
Melting point	136°C
Boiling point or range	Not applicable

Property	Result
Density at 20°C	1.46 g/mL
Vapour pressure	**Temp (°C)** — **Vapour pressure (Pa)** 20 — 3×10^{-10} 25 — 8×10^{-12}
Henry's law constant at 20°C	Henry's law constant at 20°C: 4.1×10^{-10} Pa m^3/mol
Ultraviolet (UV)–visible spectrum	$\lambda_{max} = 240$ nm
Solubility in water at 20°C	185 mg/L at pH 4,7 and 9
Solubility in organic solvents at 20°C	**Solvent** — **Solubility (g/L)** n-Heptane — < 0.1 Xylene — 0.30 Dichloromethane — 160 1-Octanol — 1.4 2-Propanol — 3.0 Polyethylene glycol — 42 Acetone — 64 Ethyl acetate — 9.4 Acetonitrile — 52 Dimethylsulfoxide — 150
n-Octanol–water partition coefficient (K_{ow})	$\log K_{ow} = 1.26$
Dissociation constant (pK_a)	No dissociable moiety
Stability (temperature, metal)	Thermally stable at ambient temperature under air. No effect on steel, stainless steel, aluminum, copper, brass and high density polyethylene.

End-Use Product—Calypso 480 SC Insecticide

Property	Result
Colour	Off-white
Odour	Slight latex paint odour
Physical state	Liquid suspension
Formulation type	Suspension
Guarantee	480 g/L nominal (limits 466–494 g/L)

Property	Result
Container material and description	1–10 L high density polyethylene bottles
Density	1.2 g/mL at 20°C
pH of 5% dispersion in water	8.5
Oxidizing or reducing action	The product does not contain any oxidizing or reducing agents.
Storage stability	The product is stable when stored for 1 year under ambient warehouse conditions in commercial containers.
Explodability	The product does not contain any components with explosive properties.

1.3 Directions for Use

Calypso 480 SC is an insecticide for use on pome fruit, including apple, pear, crab apple, Oriental pear, loquat and mayhaw, to control apple maggot, codling moth, oriental fruit moth, plum curculio, mullein bug, leafhoppers and spotted tentiform leafminer. The application rate varies depending on the insect pest (Table 1.3.1). The product is applied as a foliar treatment by ground equipment only. Calypso 480 SC Insecticide is to be applied no more than three times per season and a maximum application rate of 845 mL product/ha/year cannot be exceeded.

Table 1.3.1 Insect Control Claims for Calypso 480 SC Insecticide on Pome Fruit

Insecticide Rate	Insects Controlled
70 g a.i./ha or 145 mL product/ha	Leafhoppers and first generation spotted tentiform leafminer
70–140 g a.i./ha or 145–290 mL product/ha	Second and third generation spotted tentiform leafminer and mullein bug
140–210 g a.i./ha or 290–440 mL product/ha	Plum curculio and first generation codling moth
210 g a.i./ha or 440 mL product/ha	Apple maggot, oriental fruit moth and second generation codling moth

1.4 Mode of Action

Thiacloprid is classified as Group 4 Insecticide (Regulatory Directive DIR99-06, *Voluntary Pesticide Resistance-Management Labelling Based on Target Site/Mode of Action*). Thiacloprid acts as an agonist of the nicotinic acetylcholine receptor in the central nervous system, thus disturbing synaptic signal transmissions. Thiacloprid has both ingestion and contact activity and has a broad spectrum of activity against several orders of insects (i.e., Hemiptera, Homoptera, Diptera and Coleoptera).

2.0 Methods of Analysis

2.1 Methods for Analysis of the Technical Grade of Active Ingredient

The methods provided for the analysis of the active ingredient and the impurities in Thiacloprid Technical Insecticide was validated and assessed to be specific, precise and accurate for the determinations.

2.2 Method for Formulation Analysis

An analytical method was provided for the determination of the active ingredient in the end-use product. The method was shown to be linear, precise and specific. Based on the validation data, the method was assessed to be acceptable for use as an enforcement analytical method.

2.3 Methods for Residue Analysis

High performance liquid chromatography methods with tandem mass spectrometry (HPLC-MS/MS) were developed and proposed for enforcement purposes. These methods fulfilled the requirements with regards to specificity, accuracy and precision at the respective method limit of quantitation. Acceptable recoveries (70–120%) were obtained in plant and animal matrices. Adequate extraction efficiencies were demonstrated using radiolabelled cotton seed, cotton gin byproducts, cattle kidney, muscle and milk samples analyzed with the enforcement method.

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

The PMRA conducted a detailed review of the toxicological database for Thiacloprid (YRC 2894) Technical Insecticide. The toxicological database is complete, consisting of the full array of laboratory animal (in vivo) and cell culture (in vitro) toxicity studies currently required for health hazard assessment purposes. The studies were carried out in accordance with currently accepted international testing protocols and good laboratory practices. The scientific quality of the data is high and the database is considered adequate to characterize the toxicity of this pest control product.

The toxicokinetics and metabolism of thiacloprid were investigated in rats. Thiacloprid was rapidly absorbed following oral administration with maximum plasma concentrations at 1–2 hours at low doses (1 mg/kg bw) and 3–4 hours at high doses (100 mg/kg bw). Distribution of radioactivity was extensive among tissues and organs; however, there was no evidence of sequestration. Elimination of thiacloprid was rapid after a single oral low dose but slower following a single high dose. The primary routes of excretion were by urine (53–83%) and feces (9–39%). Females generally demonstrated slower excretion compared to males due to a longer half-life of elimination. Thiacloprid was extensively metabolized in rats with the parent compound accounting for 1–6% of the administered dose and up to 17 metabolites were identified in the urine and feces, accounting for 43–60% of the administered dose. There were minor sex-related quantitative differences in the profile of metabolites observed.

Thiacloprid and its end-use product, Calypso 480 SC (containing 41.3% of the technical grade active ingredient), were found to be of high acute toxicity via the oral route, slight acute toxicity via the inhalation route and of low acute toxicity via the dermal route. Thiacloprid was slightly irritating to the skin and minimally irritating to the eyes. Calypso 480 SC was determined to be non-irritating to the skin and eyes. Both thiacloprid and Calypso 480 SC were considered to be potential dermal sensitizers. Thiacloprid metabolites WAK 6999 and KKO 2254 were found to be of low acute toxicity via the oral route. The intermediate, 2-cyanimino-1,3-thiazolidin, generated in the chemical synthesis of thiacloprid, was found to be of high acute toxicity via the oral route. In rats, 2-cyanimino-1,3-thiazolidin was a minor metabolite representing less than 1.3% of the administered dose in urine.

In the short- and long-term oral toxicity studies in rats, the primary target organs identified were the liver and the thyroid. The predominant findings in the liver were increased serum liver enzymes indicating liver damage, induction of liver enzymes, increased liver weight, hepatocellular hypertrophy, cytoplasmic changes in hepatocytes and increased cell proliferation in the liver. The severity and type of liver findings were similar regardless of dosing duration; however, effects were noted at lower dose levels in the longer term studies. Thyroid effects included follicular epithelial hypertrophy and hyperplasia, which were accompanied by increased thyroid stimulating hormone (TSH), tri-iodothyronine (T_3) and thyroid weight at higher dose levels. Colloid alteration, pigmentation and follicular cell adenomas were observed in the thyroid gland with extended duration of dosing. Additional findings in special studies conducted to examine specifically liver and thyroid effects in rats following short-term dietary administration included lobulation of the liver, increased serum cholesterol and bile acids, increased mitotic index in the thyroid, and decreased T_3 and thyroxine (T_4). The majority of the other findings in these special studies confirmed the effects observed in the short- and long-term toxicity studies. The liver and thyroid effects were considered to be the most sensitive endpoints in the database and were observed at dose levels as low as 9.6 mg/kg bw/day following two weeks of dosing and 2.5 mg/kg bw/day following long-term dosing. Overall, the lowest no observed adverse effect level (NOAEL) for these effects was 1.2 mg/kg bw/day from the two-year dietary study in the rat.

The liver and thyroid were also affected in rats following short-term dermal and inhalation exposure. Dermal application of thiacloprid for four weeks to rats revealed minimal to moderate centrilobular hypertrophy and cytoplasmic changes in the liver as well as thyroid follicular cell hypertrophy at higher doses. Exposure of rats to thiacloprid via inhalation for four weeks resulted in clinical signs of toxicity, increased liver weight, minimal to slight hepatocellular hypertrophy, liver enzyme induction, increased thyroid weight, hypertrophy of the thyroid follicular epithelium, and increased T_3 and T_4.

Other findings of note in the rat long-term dietary toxicity study were retinal atrophy, lens degeneration, sciatic nerve degeneration, skeletal muscle atrophy, cholesterol clefts and radioculoneuropathy of the spinal cord and pituitary cholesterol clefts.

In the short- and long-term toxicity studies conducted with mice, the primary target organs identified were the liver and adrenal glands. Effects observed in the liver included increased liver weight, induction of liver enzymes and hepatocellular hypertrophy. Centrilobular fatty change in the liver, centrilobular hepatocellular degeneration and hepatocellular necrosis were noted with extended duration of dosing. A special study investigating hepatotoxicity in mice confirmed the induction of liver enzymes, and females generally showed a greater magnitude of changes in liver enzyme levels than males. The principal finding in the adrenal gland was X-zone vacuolation in female mice only. The X-zone of the adrenal gland is normally not present in adult male mice because this region of the organ involutes at puberty, unless testosterone levels are affected. Additional findings in female mice were increased eosinophilic luteinized cells and activation of interstitial glands in the ovaries. Renal toxicity in males, in the form of decreased kidney weight and a reduction in the incidence and size of male-specific vacuoles in the proximal renal tubules, was also noted in mice.

In the oral toxicity studies in the dog, the primary target organs were identified as the liver, thyroid, testes and prostate. Liver toxicity was manifested as increased organ weights, cytoplasmic change in hepatocytes, cytoplasmic inclusions and liver enzyme induction. Decreased T_4 and increased thyroxine binding capacity (TBC) were observed in the subchronic study only. Testicular effects included increased weight, sperm degeneration (also noted in the epididymides), pronounced Leydig cells and tubular hypoplasia. Prostate findings included increased weight, increased secretory activity and hypertrophy. Generally, the treatment-related findings in the chronic dog study were of a lower magnitude than in the subchronic dog study.

Thiacloprid and its metabolites were tested in a battery of in vitro and in vivo genotoxicity studies. There was no evidence of genotoxicity in any of these studies. In the chronic oral toxicity studies, treatment-related tumours were observed in the rat and mouse. There was an increased incidence of thyroid follicular cell adenomas in male and female rats. Increased incidences of uterine adenoma, uterine adenocarcinoma and uterine adenosquamous carcinoma were observed in female rats. Several mortalities in female rats were attributed to the metastasis of these uterine neoplasms to multiple organs. Chronic dietary administration of thiacloprid in mice resulted in the development of benign ovarian luteomas in female mice, as well as one malignant luteoma at the highest dose tested.

The applicant proposed that these tumours were caused by hormone alterations that were secondary to liver enzyme induction. Several special studies were conducted in an attempt to elucidate this proposed mode of action. Overall, the PMRA determined that the proposed mode of action lacked key information for its use in the risk assessment of thiacloprid. Therefore, the default to a linear low-dose extrapolation approach for the cancer risk assessment was deemed appropriate. The unit risks for thiacloprid, denoted by Q_1* (representing the upper 95% confidence limit on the slope of the dose-response curve in the low-dose region) were calculated based on the data from the chronic/oncogenicity rat and mouse studies. The most potent unit risk, 3.79×10^{-2} (mg/kg bw/day)$^{-1}$ based on the combined uterine adenoma, uterine adenocarcinoma and uterine adenosquamous carcinoma in the rat, is recommended for use in the cancer risk assessment.

In the acute neurotoxicity study, clinical signs potentially indicative of neurotoxicity were noted in rats on the same day as dose administration. It cannot be determined with certainty whether these findings are the result of a neurotoxic effect or due to an agonal state of the animals given the high acute oral toxicity of thiacloprid. Findings indicative of a potential neurotoxic effect in the subchronic neurotoxicity study were limited to decreased hind limb grip strength in male rats only. The limited findings in the acute and subchronic neurotoxicity studies, coupled with the fact that there was no evidence of neuropathology in these studies, do not indicate that thiacloprid exhibited an overt neurotoxic effect following acute or short-term oral exposure. In the developmental neurotoxicity study, changes were noted in brain morphometry measurements (decreased width of the corpus striatum, corpus callosum and hippocampal gyrus) in male offspring at the highest dose tested. However, there is uncertainty whether brain morphometry changes would be observed at lower dose levels because evaluations were not conducted in offspring from the low and mid-dose groups. Delayed sexual maturation in males and females was also observed in this study at maternally toxic doses.

In a two-generation reproductive toxicity study in rats, parental effects in both the parental (P) and first filial (F_1) generations included increased liver weight, hepatocytomegaly, increased thyroid weight and thyroid follicular cell hypertrophy in the mid- and high-dose groups. Dystocia resulting in early death or sacrifice was noted in the mid- and high-dose group in the P generation only; these animals also exhibited increased severity of liver necrosis. Reproductive and offspring toxicity were noted in both the F_1 and second filial (F_2) generations. There was an increase in the percentage of stillborn pups at the highest dose tested, which resulted in reduced litter sizes and a decreased live birth index in both generations. Three complete litter losses were also observed in the F_1 generation at the highest dose tested. From postnatal day (PND) 0 to 4, there was an increased percentage of pup deaths resulting in a decreased viability index at the highest dose tested. Pup body weights were also reduced in both generations at the mid- and high-dose. A modified one-generation reproductive toxicity study was subsequently conducted to further examine dystocia and increased stillborn pups noted in the two-generation reproductive toxicity study. A similar spectrum of toxicity findings (maternal deaths, dystocia, decreased gestation index, implantations in dams, increased percentage of stillborn pups, reduced litter sizes and increased pup deaths between PND 0 and 4) was observed in the modified one-generation reproductive toxicity study at a higher dose level than in the two-generation study. It is worth noting that a dose level comparable to that which resulted in treatment-related effects in the two-generation study was also used in the one-generation study, but did not result in adverse findings.

Special studies were conducted to further examine the dystocia and stillbirths in the reproductive toxicity studies. These studies demonstrated that treated pregnant rats had higher plasma levels of thiacloprid and increased hormone levels (luteinizing hormone, 17β-estradiol, corticosterone and progesterone) compared to untreated pregnant rats. However, there was uncertainty in regards to potentially higher test compound intake in pregnant animals compared to non-pregnant animals. Overall findings in the special studies did not provide sufficient evidence to fully explain the potential cause of dystocia and stillbirths.

Developmental toxicity was evident in both rats and rabbits at the highest dose tested, which also resulted in maternal toxicity. The rat developmental toxicity study demonstrated increased resorptions, necrotic placental borders, skeletal malformations (dysplastic humerus, radius and scapulae), skeletal variations (wavy ribs, enlarged fontanelle, asymmetrical sternebrae) and skeletal retardations. In the rabbit developmental toxicity study, increased resorptions, skeletal variations (enlarged fontanelle), skeletal retardations, decreased placental weight and decreased male sex ratio were observed. Abortions and complete litter resorptions were also observed in maternal rabbits at the highest dose tested, where other reproductive effects (increased postimplantation loss, increased early and late resorptions) also occurred.

For assessing risks from potential residues in food or from products used in or around homes or schools, the *Pest Control Products Act* requires the application of an additional 10-fold factor to threshold effects. This factor should take into account potential prenatal and postnatal toxicity and completeness of the data with respect to the exposure of and toxicity to infants and children. A different factor may be determined to be appropriate on the basis of reliable scientific data.

With respect to the completeness of the toxicity database, extensive data were available on thiacloprid and no additional studies are required at this time. The potential prenatal and postnatal toxicity in rats and potential prenatal developmental toxicity studies in rabbits provided no indication of increased susceptibility of rat or rabbit fetuses to in utero exposure to thiacloprid. There was no indication of increased susceptibility in the offspring compared to parental animals in the reproduction studies. Brain morphometry evaluations were not conducted on pups at the low- and mid-dose groups in the developmental neurotoxicity study. Consequently, there was an uncertainty regarding prenatal developmental neurotoxicity in pups at those dose levels. On the basis of this information, the 10-fold factor required under the *Pest Control Products Act* factor can be reduced to 3-fold because no increased susceptibility was observed following in utero exposure to rats or rabbits in the developmental studies; however, a threefold should be retained to address the uncertainty regarding prenatal developmental neurotoxicity.

3.2 Determination of Acceptable Daily Intake

The recommended acceptable daily intake (ADI) is 0.004 mg/kg bw/day, calculated using the NOAEL in females of 1.2 mg/kg bw/day from the two-year dietary study in the rat. Treatment-related effects at the lowest observed adverse effect level (LOAEL) (25.2/33.5 mg/kg bw/day in males/females) included hepatocellular hypertrophy, cytoplasmic changes in the liver and thyroid follicular epithelial hypertrophy. This study is of appropriate route and duration, is protective of the critical endpoints of liver and thyroid toxicity and provides the lowest NOAEL in the database. The standard uncertainty factor (UF) of 100 has been applied to account for interspecies extrapolation and intraspecies variability. A threefold factor has been retained to address uncertainty regarding prenatal and postnatal toxicity (lack of brain morphometric measurements in offspring from the low- and mid-dose groups in the developmental neurotoxicity study).

The ADI is calculated according to the following formula:

$$\text{ADI} = \frac{\text{NOAEL}}{\text{UF}} = \frac{1.2\ \text{mg/kg bw/day}}{300} = 0.004\ \text{mg/kg bw/day}$$

The ADI of 0.004 mg/kg bw/day provides adequate margins (≥ 1000) to the NOAEL for the following endpoints of concern in the database: resorptions and malformations in the rat developmental toxicity study, abortions and resorptions in the rabbit developmental toxicity study, deaths of pregnant animals in the one-generation and two-generation reproductive toxicity studies as well as delayed sexual maturation in the developmental neurotoxicity study.

3.3 Determination of Acute Reference Dose

The recommended acute reference dose (ARfD) is 0.01 mg/kg bw, calculated using the NOAEL in females of 3.1 mg/kg bw from the acute neurotoxicity study. Treatment-related effects at the LOAEL (11 mg/kg bw) in this study included decreased motor and locomotor activity in females. The standard uncertainty factor of 100 has been applied to account for intraspecies extrapolation and interspecies variability. A threefold factor has been retained to address uncertainty regarding prenatal and postnatal toxicity (lack of brain morphometric measurements in offspring from the low- and mid-dose groups in the developmental neurotoxicity study).

The ARfD is calculated according to the following formula:

$$\text{ARfD} = \frac{\text{NOAEL}}{\text{UF}} = \frac{3.1\ \text{mg/kg bw}}{300} = 0.01\ \text{mg/kg bw}$$

The ARfD of 0.01 mg/kg bw provides adequate margins (≥ 300) to the NOAEL for the following serious endpoints noted in the database after acute exposures: abortions in the rabbit developmental toxicity study, delayed sexual maturation in the developmental neurotoxicity study, deaths of pregnant animals in special non-guideline reproduction studies designed to investigate the occurrence of difficult labour and deaths noted in pregnant rats following two to six days of gavage dosing with thiacloprid at 35 mg/kg bw/day. Other serious endpoints requiring adequate protection occurred following several weeks of exposure to thiacloprid and are not relevant to the selection of the ARfD.

The selected ARfD is also considered to be appropriate for the acute aggregate exposure and risk assessment.

3.4 Occupational and Bystander Risk Assessment

3.4.1 Toxicological Endpoints

For short-term dermal exposure, the NOAEL of 2.3 mg/kg bw/day from the special two-week dietary study in the rat that assessed liver and thyroid toxicity was selected. Treatment-related effects at the LOAEL (11/10 mg/kg bw in males/females) included increased serum levels of cholesterol and bile acids, liver enzyme induction and lobulation of the liver surface. This study is of appropriate duration and is protective of the critical endpoints of liver and thyroid toxicity. The four-week dermal study was not considered to be appropriate for use in risk assessment because several key endpoints (histopathology of the ovaries and uterus, liver enzyme induction, thyroid hormone levels) were not assessed; thus, the study was considered supplemental.

For short-term inhalation exposure, the NOAEL of 0.02 mg/L (4.94 mg/kg bw/day) from the four-week inhalation toxicity study in the rat was selected. Treatment-related effects at the LOAEL of 0.14 mg/L (38.9 mg/kg bw/day) included clinical signs of toxicity, clinical chemistry changes, increased liver and thyroid weights, as well as liver and thyroid pathology. This study was of appropriate route and duration, and is protective of the critical endpoints of liver and thyroid toxicity.

For intermediate-term dermal exposure, the NOAEL of 1.2 mg/kg bw/day in males from the two-year chronic dietary toxicity study in the rat was selected. Treatment-related effects at the LOAEL (2.5/3.3 in males/females) included liver pathology (hepatocellular hypertrophy and cytoplasmic change, mixed eosinophilic/clear cell focus), liver enzyme induction and thyroid pathology (follicular epithelial hypertrophy) as well as retinal atrophy. This study is of longer duration than the expected exposure scenario, but is protective of the critical endpoints of liver and thyroid toxicity and protects for other serious endpoints in the database.

For all exposure scenarios, a target MOE of 300 was deemed appropriate. The standard uncertainty factor of 100 has been applied to account for intraspecies extrapolation and interspecies variability. A threefold factor has been retained to account for uncertainty regarding prenatal and postnatal toxicity (lack of brain morphometric measurements in offspring from the low- and mid-dose groups in the developmental neurotoxicity study).

The toxicological endpoints and target MOE selected for the occupational and bystander risk assessments provide adequate margins (≥ 300) to serious endpoints noted in the database relevant to the duration of exposure. For example, the endpoint and target MOE selected for short-term dermal exposure provide adequate margins (≥ 300) to the following serious endpoints noted in the database following short-term exposure: resorptions and malformations in the rat developmental toxicity study, abortions and resorptions in the rabbit developmental toxicity study and delayed sexual maturation in the developmental neurotoxicity study. The endpoint and target MOE selected for intermediate-term dermal exposure provide an adequate margin (≥ 1000) to the deaths in pregnant animals in the first generation of the two-generation reproductive toxicity study.

Dermal Absorption

An in vivo dermal absorption study was conducted with an end-use formulation containing thiacloprid (PMRA 1247105). A single dose (6 $\mu g/cm^2$) of the test substance was applied to shaved skin on the backs of 5 male Rhesus monkeys. The animals were restrained on a table for dosing and in a primate chair for the 8-hour exposure period, after which the animals were placed in metabolism cages. During the exposure period, the dose site was covered with a protective dome secured in place with tape. Urine and feces were collected for 120 hours postdosing. Excreta were collected for an additional 24 hours until radioactivity deceased to less than twice the background level. The majority of the absorbed dose was eliminated in the urine and feces (2.32% and 0.08% respectively) or collected in the cage debris/rinse (0.41%). The mean total excreted radioactivity was 3.15%. Overall excretion was essentially complete by 24 hours. The overall mean total recovery of radioactivity from both excreta and the application site was 96.75%. A dermal absorption value of 3% is considered appropriate for use in the occupational and residential risk assessments.

3.4.2 Occupational Exposure and Risk

3.4.2.1 Mixer/Loader/Applicator Exposure and Risk

Exposure estimates were derived for farmers applying Calypso 480 SC in pome fruit orchards using ground equipment (airblast) at a maximum application rate of 210 g a.i./ha.

Exposure estimates were based on data from the Pesticide Handlers Exposure Database (PHED) Version 1.1, a compilation of generic mixer/loader and applicator passive dosimetry data.

For handler exposure, daily unit exposures from dermal and inhalation routes, normalized to µ34g a.i./kg a.i. handled, were derived using mixer/loader subsets (liquid; open pour; single layer with gloves) and applicator subsets (airblast; open cab single layer). All were high confidence PHED runs with adequate numbers of replicates and A and B grade data. Exposure estimates are presented on the basis of the best-fit measure of central tendency, i.e., summing the measure of central tendency for each body part which is most appropriate to the distribution of data for that body part.

For the risk assessment, route-specific MOEs were derived based on the NOAEL of 2.3 mg/kg bw/day from the 2-week dietary study for the dermal route or the NOAEL of 4.94 mg/kg bw/day from the 4-week inhalation study for the inhalation route. All MOEs exceed the target of 300 and are considered acceptable.

For the mixer/loader and applicator exposure and risk assessment for cancer, a lifetime average daily dose (LADD) was calculated based on the total (dermal + inhalation) daily systemic exposure, a frequency of application of 6 days per year, a 40-year worklife and a 75-year lifespan. The resulting LADD of 1.42×10^{-5} mg/kg bw/day was coupled with the unit risk (Q_1*) of 0.0379 to yield a risk level of 5.38×10^{-7}. This risk level is considered acceptable.

Table 3.4.2.1.1 Route-specific Mixer/Loader/Applicator Exposure and Risk Assessment

Exposure Scenario	Daily exposure (µg a.i./kg bw/day)[a]		Dermal MOE[c]	Inhalation MOE[d]
	Dermal[b]	Inhalation		
Farmer—mixer/loader/ applicator	7.21	0.08	1800	12 000

[a] PHED unit exposure value (µg a.i./kg a.i. handled) × application rate (0.210 kg a.i./ha) × area treated per day (16 ha) / body weight (70 kg). Based on applicators wearing a long-sleeved shirt, long plants and gloves.

[b] Based on dermal absorption value of 3.0%

[c] Based on a NOAEL of 2.3 mg/kg bw/day from the 2-week feeding study; target MOE of 300.

[d] Based on a NOAEL of 4.2 mg/kg bw/day from the 4-week inhalation study; target MOE of 300.

3.4.2.2 Postapplication Worker Exposure and Risk

Postapplication exposure estimates were derived for workers who enter treated pome fruit orchards routinely throughout the growing season by coupling dislodgeable foliar residue (DFR) data with activity-specific transfer coefficients.

DFR data was provided in a chemical-specific DFR study (PMRA 1251222). In this study, field trials were conducted at three sites (New York, Ontario and Washington) to determine the dissipation of thiacloprid residue from apple tree foliage following two foliar applications of Calypso 4F. Calypso 4F is a suspension concentrate formulation containing 480 g thiacloprid/L. Actual application rates ranged from 0.134 to 0.179 kg a.i./ha/application with a 6- to 7-day interval between applications. All applications were made using airblast equipment. Leaf punch samples totalling a surface area of 400 cm^2 were collected prior to the first application and at various times up to 35 days following the second application. Thiacloprid residue was dislodged from each sample with a detergent solution. Control and field recovery samples were prepared at each test site using the dislodging solutions from control leaf punch samples to verify storage and stability of the samples and to provide method recovery verification during analysis. DFR were quantified by LC-MS/MS. DFR values were corrected for incomplete recovery.

Peak DFR values after the second application were 0.390, 0.392 and 0.536 µg/cm^2 at the New York, Ontario and Washington test sites, respectively. Logarithmic regression analysis of the dissipation of DFR following the second application were well correlated with time (r^2 of 0.89–0.95). Half-lives differed in each region, with the longest occurring at the Washington test site (34 days), followed by Ontario (16 days) and New York (8 days).

The study was considered acceptable and the application regime was considered to be generally representative of the proposed Canadian uses. A lack of rainfall at the Washington site could account for the slower dissipation of residues at that site. The New York and Ontario sites are considered more representative of Canadian growing conditions and assessment data from the Ontario site is used (i.e., peak residue of 0.392 µg/cm^2) for the postapplication exposure.

For the postapplication exposure assessment, dermal exposure estimates were determined by coupling DFR data with activity-specific transfer coefficients for reentry activities in pome fruit crops. As the applicant is a member of the Agricultural Reentry Exposure Task Force (ARTF), the transfer coefficients based on ARTF data were used. Dermal exposure was adjusted for dermal absorption (3%) and an 8-hour workday was assumed.

A summary of postapplication exposure estimates for Calypso 480 SC on the day of the last application are presented in Table 3.4.2.2.1.

Table 3.4.2.2.1 Postapplication Exposure Estimates and MOEs

Re-entry Activity	Transfer Coefficient (cm^2/hr)	Systemic Exposure After Final Application (mg/kg bw/day)[a]	MOE After Final Application[b]
Hand thinning	3000	0.00400	300
Hand harvesting	1500	0.00200	600
Hand-line irrigation	1100	0.00150	800
Pruning, pinching, tying, training, scouting	500	0.00067	1800
Hand weeding	100	0.00013	9200

[a] Exposure estimates were calculated using the following formula:

$$\frac{\text{DFR } (\mu g/cm^2) \times \text{transfer coefficient } (cm^2/hr) \times \text{8-hour workday} \times \text{conversion factor } (1\ mg/1000\ \mu g) \times 3\%\ \text{dermal absorption}}{\text{body weight } (70\ kg)}$$

[b] Based on a NOAEL of 1.2 mg/kg bw/day from the 2-year chronic dietary study; target MOE 300.

The target MOE is achieved for all reentry activities and are considered acceptable.

For the mixer/loader and applicator exposure and risk assessment for cancer, a lifetime average daily dose (LADD) was calculated based on the total (dermal + inhalation) daily systemic exposure, a frequency of application of 6 days per year, a 40-year worklife and a 75-year lifespan. The resulting LADD of 1.42×10^{-5} mg/kg bw/day was coupled with the unit risk (Q_1*) of 0.0379 to yield a risk level of 5.38×10^{-7}. This risk level is considered acceptable.

Table 3.4.2.1.1 Route-specific Mixer/Loader/Applicator Exposure and Risk Assessment

Exposure Scenario	Daily exposure (µg a.i./kg bw/day)[a]		Dermal MOE[c]	Inhalation MOE[d]
	Dermal[b]	Inhalation		
Farmer—mixer/loader/applicator	7.21	0.08	1800	12 000

[a] PHED unit exposure value (µg a.i./kg a.i. handled) × application rate (0.210 kg a.i./ha) × area treated per day (16 ha) / body weight (70 kg). Based on applicators wearing a long-sleeved shirt, long plants and gloves.

[b] Based on dermal absorption value of 3.0%

[c] Based on a NOAEL of 2.3 mg/kg bw/day from the 2-week feeding study; target MOE of 300.

[d] Based on a NOAEL of 4.2 mg/kg bw/day from the 4-week inhalation study; target MOE of 300.

3.4.2.2 Postapplication Worker Exposure and Risk

Postapplication exposure estimates were derived for workers who enter treated pome fruit orchards routinely throughout the growing season by coupling dislodgeable foliar residue (DFR) data with activity-specific transfer coefficients.

DFR data was provided in a chemical-specific DFR study (PMRA 1251222). In this study, field trials were conducted at three sites (New York, Ontario and Washington) to determine the dissipation of thiacloprid residue from apple tree foliage following two foliar applications of Calypso 4F. Calypso 4F is a suspension concentrate formulation containing 480 g thiacloprid/L. Actual application rates ranged from 0.134 to 0.179 kg a.i./ha/application with a 6- to 7-day interval between applications. All applications were made using airblast equipment. Leaf punch samples totalling a surface area of 400 cm^2 were collected prior to the first application and at various times up to 35 days following the second application. Thiacloprid residue was dislodged from each sample with a detergent solution. Control and field recovery samples were prepared at each test site using the dislodging solutions from control leaf punch samples to verify storage and stability of the samples and to provide method recovery verification during analysis. DFR were quantified by LC-MS/MS. DFR values were corrected for incomplete recovery.

Peak DFR values after the second application were 0.390, 0.392 and 0.536 µg/cm^2 at the New York, Ontario and Washington test sites, respectively. Logarithmic regression analysis of the dissipation of DFR following the second application were well correlated with time (r^2 of 0.89–0.95). Half-lives differed in each region, with the longest occurring at the Washington test site (34 days), followed by Ontario (16 days) and New York (8 days).

The study was considered acceptable and the application regime was considered to be generally representative of the proposed Canadian uses. A lack of rainfall at the Washington site could account for the slower dissipation of residues at that site. The New York and Ontario sites are considered more representative of Canadian growing conditions and assessment data from the Ontario site is used (i.e., peak residue of 0.392 µg/cm^2) for the postapplication exposure.

For the postapplication exposure assessment, dermal exposure estimates were determined by coupling DFR data with activity-specific transfer coefficients for reentry activities in pome fruit crops. As the applicant is a member of the Agricultural Reentry Exposure Task Force (ARTF), the transfer coefficients based on ARTF data were used. Dermal exposure was adjusted for dermal absorption (3%) and an 8-hour workday was assumed.

A summary of postapplication exposure estimates for Calypso 480 SC on the day of the last application are presented in Table 3.4.2.2.1.

Table 3.4.2.2.1 Postapplication Exposure Estimates and MOEs

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Hand-line irrigation	1100	0.00150	800
Pruning, pinching, tying, training, scouting	500	0.00067	1800
Hand weeding	100	0.00013	9200

[a] Exposure estimates were calculated using the following formula:

$$\frac{\text{DFR } (\mu g/cm^2) \times \text{transfer coefficient } (cm^2/hr) \times \text{8-hour workday} \times \text{conversion factor } (1\ mg/1000\ \mu g) \times 3\%\text{ dermal absorption}}{\text{body weight } (70\ kg)}$$

[b] Based on a NOAEL of 1.2 mg/kg bw/day from the 2-year chronic dietary study; target MOE 300.

The target MOE is achieved for all reentry activities and are considered acceptable.

For the postapplication exposure and risk assessment for cancer, the LADD was calculated based on the daily systemic exposures for workers harvesting pome fruit daily throughout the season (120 days), a 40-year worklife and a 75-year lifespan. DFR dissipation was factored into the derivation of the LADD. Based on the DFR data from the Ontario site, the LADD was estimated to be 0.0001 mg/kg bw/day. This value was coupled with the Q_1* of 0.0379 to yield a risk level of 2.53×10^{-6}, which is considered acceptable. This assessment is considered conservative as it is assumed that a relatively high foliar contact activity, hand harvesting, is conducted for full workdays, daily, for a 120-day period.

3.4.3 Residential Exposure and Risk

3.4.3.1 Handler Exposure and Risk

There are no domestic class products; therefore, a residential handler assessment was not required.

3.4.3.2 Postapplication Exposure and Risk

There is potential for occasional acute exposures to adults and children (6–12 years) while harvesting apples at pick-your-own commercial farming operations As such, estimates of systemic exposure from this activity were derived. Based on the peak DFR value identified in the postapplication exposure assessment after the 30-day preharvest interval (PHI) (0.103 $\mu g/m^2$), the harvesting transfer coefficient (1500 cm^2/hr), a 2-hour exposure for children and a 4-hour exposure for adults, the 3% dermal absorption value and a body weight of 39.1 kg for children and a body weight of 70 kg for adults, exposure estimates from harvesting apples were calculated to be 0.00023 mg/kg bw/day for children and 0.00026 mg/kg bw/day for adults.

These exposure estimates are considered as part of the aggregate exposure and risk assessment presented in Section 3.5.3.

3.4.3.3 Bystander Exposure and Risk

For bystanders, exposure is expected to be much less than that of field workers and is considered negligible.

3.5 Food Residues Exposure Assessment

3.5.1 Residues in Plant and Animal Foodstuffs

The residue definition for risk assessment and enforcement in plant products and animal commodities is the combined residues of thiacloprid ([3-[(6-chloro-3-pyridinyl)methyl]-2-thiazolidinylidene] cyanamide) and metabolites retaining the thiazolidine ring intact, measured and expressed in terms of thiacloprid, per se. The data gathering/enforcement analytical methodology, LC-MS/MS, is valid for the quantification of thiacloprid residues in almond (nut, hull), apple, pear and ruminant livestock matrices (meat, milk, fat, liver and kidney). The residues of thiacloprid are stable when stored in a freezer at -18°C for 540 days. Raw agricultural commodities were processed. The residues of thiacloprid did not concentrate in processed apple commodities, with the exception of apple wet pomace. Supervised residue trials in or on apple and pear conducted throughout the United States and Canada using end-use products containing thiacloprid are sufficient to support the proposed maximum residue limits.

3.5.2 Dietary Risk Assessment

Acute and chronic dietary risk assessments were conducted using the Dietary Exposure Evaluation Model (DEEM–FCID™, Version 2.0), which uses updated food consumption data from the United States Department of Agriculture's Continuing Survey of Food Intakes by Individuals, 1994–1996 and 1998.

3.5.2.1 Chronic Dietary Exposure Results and Characterization

The following assumptions were made in a refined chronic analysis: residues of apple and pear based on supervised trial median value, percentage of crop treated, experimental and commercial processing factors as well as a zero value for all animal commodities. The refined chronic dietary exposure from all supported thiacloprid food uses (alone) for the total population is 0.6% of the ADI. Aggregate exposure from food and water is considered acceptable. The PMRA estimates that chronic dietary exposure to thiacloprid from food and water is 1.4% (0.000057 mg/kg bw/day) of the ADI for the total population. The highest exposure and risk estimate is for all infants (< 1 year) at 6.2% (0.000247 mg/kg bw/day) of the ADI.

3.5.2.2 Acute Dietary Exposure Results and Characterization

The following assumptions were made in a refined acute analysis: 100% crop treated, experimental and commercial processing factors, maximum residues in apple and pear based on supervised field trials and anticipated residue value in all animal commodities. The refined acute dietary exposure (food alone) for all supported thiacloprid registered commodities is estimated to be 44.8% (0.004484 mg/kg/day) of the ARfD for the highest exposed subgroup (infants < 1 year) (95th percentile, deterministic). Aggregate exposure from food and water is considered acceptable at 46.4% of the ARfD for infants.

3.5.3 Aggregate Exposure and Risk

An aggregate exposure and risk assessment (dietary + residential) was conducted for thiacloprid as there is potential for occasional acute exposures to adults and children (6 to 12 years old) during harvesting activities at pick-your-own commercial farming operations. As the pick-your-own assessment is conducted for adults and children only, the aggregate exposure and risk assessment was conducted for these two subpopulations.

Exposure inputs are provided in Table 3.5.3.1 and include dermal exposure from harvesting apples at pick-your-own commercial operations (adjusted for dermal absorption), dietary exposure from food and water, and acute exposure from consumption of fresh apple with peel only. Given the exposure scenario is of acute duration, the appropriate toxicology endpoint is the NOAEL of 3.1 mg/kg bw from the acute neurotoxicity study.

Table 3.5.3.1 Aggregate Exposure and Risk Assessment

Subpopulation	Pick-Your-Own Harvesting (mg/kg bw/day)	Chronic Dietary[a] (mg/kg bw/day)	Acute Dietary[b] (mg/kg bw/day)	Aggregate Exposure[c] (mg/kg bw/day)	MOE[d]
Children (6–12 yr)	0.00023	0.00018	0.002153	0.00256	1210
Total population	0.00026	0.000057	0.000609	0.000926	3350

[a] Food + water (refined)
[b] Fresh apple with peel only (refined)
[c] Sum of pick-your-own harvesting exposure, chronic dietary exposure and acute dietary exposure
[d] MOE = based on NOAEL of 3.1 mg/kg bw from acute neurotoxicity study. Target MOE of 300.

The target MOE is achieved and aggregate exposure and risk is considered acceptable.

3.5.4 Maximum Residue Limits

Table 3.5.4.1 Maximum Residue Limits

MRLs (ppm)	Foods
0.3	Apple, crab apple, loquat, mayhaw, pear, oriental pear and quince
0.15	Liver of cattle, sheep, goat, horse
0.05	Kidney of cattle, sheep, goat, horse
0.03	Meat of cattle, sheep, goat, horse
0.05	Meat byproducts of cattle, sheep, goat, horse
0.02	Fat of cattle, sheep, goat, horse
0.03	Milk

Crop group are defined in Appendix III of this document.

For additional information on maximum residue limits (MRL) in terms of the international situation and trade implications, refer to Appendix II.

The nature of the residues in animal and plant matrices, analytical methodology, field trial data as well as the acute and chronic dietary risk estimates are summarized in Appendix I, Table 5 and 6.

4.0 Impact on the Environment

4.1 Fate and Behaviour in the Environment

Thiacloprid reaches the soil when applied as an insecticide on pome fruit trees. Under field conditions, its half-life ranges from 2 to 30 days. YRC 2894-amide (KKO 2254) and YRC 2894 sulfonic acid (WAK 6999) are major transformation products. Their laboratory half-lives in soil range from 46 to 224 days and from 23 to 77 days, respectively. The route of dissipation of thiacloprid in the terrestrial environment is primarily transformation by soil microorganisms. Field data indicate that neither thiacloprid nor its major transformation products are expected to leach through the soil profile beyond 30 cm; therefore, they are not expected to enter groundwater.

Thiacloprid could reach water bodies by spray drift or runoff. It is very soluble in water at pH 4 to pH 9. Its rate of dissipation from water systems is variable, with half-lives ranging from 11 to 26 days under aerobic conditions. Its route of dissipation is transformation through microbial activity, either in water or in sediment. Binding of thiacloprid to sediment increases with the organic matter content. YRC 2894-amide is a major transformation product in both water and sediment and has a half-life of 142 days. Thiacloprid is stable under anaerobic conditions.

The low vapour pressure and Henry's law constant indicate that thiacloprid is non-volatile in the environment. Therefore, thiacloprid residues are not expected in the atmosphere. Long-range transport is not expected either.

Data on the fate and behaviour of thiacloprid and its major transformation products are summarized in Appendix I, Table 7. The transformation pathway for thiacloprid is summarized in Appendix I, Figure 1.

4.2 Effects on Non-Target Species

To estimate risk of potential adverse effects on non-target species, a quotient method is used. The risk quotient is calculated by dividing the exposure estimate by a value representing the most sensitive toxic endpoint. Risk quotients are initially calculated for a screening-level assessment to obtain higher estimates of risk. The screening-level assessment is a realistic worst case scenario that is tending to worst case, but is not beyond the bounds of possibility. Low risk is predicted if the risk quotient is less than the trigger value of one. Risk increases with risk quotient values greater than one. If the trigger values are exceeded under the realistic worst-case scenario, then a refinement of the assessment is necessary to evaluate how frequently impacts might be expected in the range of conditions that occur in the field. A refined assessment takes into consideration more realistic exposure scenarios (e.g., drift to non-target habitats and runoff to water bodies) and may consider different toxicity endpoints.

4.2.1 Effects on Terrestrial Organisms

Risk of thiacloprid to terrestrial organisms was based upon evaluation of toxicity data for two mammal and two bird species representing vertebrates (acute gavage, short- and long-term dietary exposure); one bee species, one other arthropod species and one earthworm species representing invertebrates (acute or chronic exposure); and ten crop species representing plants (short-term exposure) (Appendix I, Table 8). Risk of the two major transformation products of thiacloprid, YRC 2894-amide and YRC 2894-sulfonic acid, to terrestrial organisms was based upon toxicity data available for the rat.

For terrestrial vertebrates, thiacloprid caused mortality to birds at a concentration of 551 mg a.i./kg bw when administered by gavage. When exposed to thiacloprid, various sublethal effects were noted for birds exposed to 289 mg a.i./kg bw and more (gavage), or to 2550 mg a.i./kg diet and more (short-term dietary exposure). Bird reproduction was impaired (reduced chick survival) at 140 mg a.i./kg diet following long-term dietary exposure. Thiacloprid caused mortality for mammals at a dose level of 100 mg a.i./kg bw when administered by gavage. Clinical signs of toxicity were observed at concentrations greater than or equal to 70 mg a.i./kg bw. Exposure of mammals to YRC 2894-amide (KKO 2254) and YRC 2894-sulfonic acid (WAK 6999) was not lethal at a dose level of 2000 mg/kg bw. In spite of the various deleterious effects observed for terrestrial vertebrates, risk quotients calculated under a realistic worst-case scenario indicate that thiacloprid presents a low risk to birds and wild mammals following acute, short-term or long-term exposure; all risk quotients are less than one (Appendix I, Table 9). Similarly, YRC 2894-amide and YRC 2894-sulfonic acid present a low risk to mammals.

For terrestrial invertebrates, Calypso 480 SC Insecticide was harmful to the predatory green lacewing *Chrysopa carnea* on a chronic basis (35 days). For this arthropod, a 58% reduction of reproductive performance (relative to control) was noted at a treatment rate (0.91 g a.i./ha) several times lower than the maximum proposed label rate for a single application (210 g a.i./ha). For bees, however, the lethal dose 50% (LD_{50}) values for acute oral or contact exposure to either the active ingredient or the end-use product ranged from 5920 to 42 300 g a.i./ha, which is much higher than the proposed maximum single application rate. Observable sublethal effects (reduced body weight) following short-term exposure to either the active ingredient or the end-use product were reported in earthworms at concentrations of 3 mg a.i./kg dw soil. Risk quotients calculated under realistic worst-case scenarios indicate that chronic exposure to Calypso 480 SC Insecticide presents the greatest risk to beneficial arthropods other than bees (Appendix I, Table 9).

A refinement of the exposure scenario for beneficial arthropods could not be made as the screening concentration already considers probable conditions in the field (drift on organisms). In order to mitigate risk, specific instructions to reduce spray drift are provided on the product label to minimize exposure of these organisms.

For terrestrial plants, no effects (i.e., < 25% reduction) on seedling emergence and vegetative vigour were observed in ten plant species at 560 g a.i./ha, the highest rate of Calypso 480 SC Insecticide tested. Risk quotients calculated under a realistic worst-case scenario are less then one for both endpoints (Appendix I, Table 9).

4.2.2 Effects on Aquatic Organisms

Risk of thiacloprid to aquatic organisms was based upon evaluation of toxicity data for ten freshwater species (three invertebrates, three fish, three algae and one vascular plant) and three estuarine/marine species (two invertebrates and one fish) (Appendix I, Table 8). Risk of the two major transformation products of thiacloprid, YRC 2894-amide and YRC 2894-sulfonic acid, to aquatic organisms was based upon the toxicity data available for freshwater species (three invertebrates, two fish and one alga); no data were available for estuarine/marine species.

In acute dose-response studies, thiacloprid caused sublethal effects at various concentrations for daphnids, all fish species and the eastern oyster (no observed effect concentration [NOEC] values between 1.7 mg a.i./L and 13.1 mg a.i./L). Thiacloprid was not toxic to algae or vascular plants at concentrations lower than or equal to 16.8 mg a.i./L. Deleterious effects (reduced growth in parental generation) were reported following chronic exposure of daphnids and fish at concentrations higher than 1.6 mg a.i./L. The toxicity of thiacloprid to amphibians was estimated using endpoints from early life-stage fish studies as surrogate data. The transformation products YRC 2894-amide and YRC 2894-sulfonic acid were not toxic to the organisms tested, except for amphipods and for bluegill sunfish for which sublethal effects or mortality were noted at concentrations of 12.0 mg/L or 78.6 mg/L, respectively. Risk quotients calculated under a realistic worst-case scenario indicate that thiacloprid and both its transformation products present a low risk to daphnids, freshwater and marine fish, algae, vascular plants, amphibians and eastern oyster following acute or chronic exposure; risk quotients are less than one (Appendix I, Table 9).

Freshwater insects (chironomids) were the most sensitive aquatic organisms tested with thiacloprid (Appendix I, Table 8). The NOEC value for emergence and development time was 0.68 µg a.i./L for these organisms. Amphipods and mysid shrimps were equally affected by thiacloprid on an acute basis (NOEC values of 11.3 and 9.7 µg a.i./L). The formulated product was nearly three times more toxic than the technical active ingredient for mysid shrimps after acute exposure. On a chronic basis, thiacloprid negatively affected growth and reproduction of mysid shrimps at concentrations of 2.2 µg a.i./L. Risk quotients calculated under a realistic worst-case scenario exceeded the trigger value of one for all these organisms (Appendix I, Table 9).

A refined assessment considered that the most likely routes of entry of thiacloprid into water are through drift and runoff (Appendix I, Table 10). For drift, the screening level assumes 100% drift to a water body. The actual maximum drift deposition expected for airblast application at one metre downwind of a sensitive habitat is 74% (early application). Using the corresponding expected concentration of thiacloprid in water still led to risk quotients higher than one for all organisms identified as being at risk under a worst-case scenario (i.e., chironomids, amphipods and mysid shrimps). Therefore, buffer zones larger than one metre are required to mitigate the risk to aquatic invertebrates. Buffer zones have been calculated and added to the product label under the **DIRECTIONS FOR USE**. Their maximum widths are 30 m and 25 m for freshwater and estuarine/marine habitats, respectively. The runoff assessment first involved determining the geographic areas where the major crop (apple) is grown. Then, the scenario that generated the highest expected thiacloprid concentration for either freshwater (apple orchard in Quebec) or estuarine/marine habitats (apple orchard in Nova Scotia) was chosen, assuming no drift. The calculated risk quotients were below one for acute exposure of both freshwater and marine invertebrates. The risk is considered as low and no mitigation is needed. However, the risk quotients for chronic exposure were 2.51 and 1.77 for freshwater and marine invertebrates, respectively, indicating higher risk. No means to mitigate risk from run-off are currently available. Label statements providing instructions to minimize run-off as well as a label statement indicating the toxicity of this pesticide to aquatic organisms have been added to the product label.

5.0 Value

5.1 Effectiveness Against Pests

Data from thirty small plot efficacy studies conducted between 1995 and 2002 in Ontario, Nova Scotia and the northern United States were submitted. Where multiple pests were present in one study, each pest species was considered as one trial for the purposes of summary by pest. Therefore, 45 trials were reviewed. For each trial, an appropriate experimental design was employed, which included an untreated control as well as a positive control.

The control of individual insect species or the reduction in damage caused by insect pests was assessed visually and compared to an untreated control. Observations were made at various times throughout the growing season after treatment(s) occurred.

5.1.1 Acceptable Efficacy Claims

5.1.1.1 Foliar Applications of Calypso 480 SC Insecticide on Pome Fruit

The submitted efficacy data established the lowest effective rate for several of the proposed pests, i.e., plum curculio, apple maggot and codling moth, and acceptable rates were identified for the remaining pests on apple and pear. Pest biology and efficacy is expected to be similar on all crops in the pome fruit group. The accepted rates are identified in Table 5.1.1.1.1.

Table 5.1.1.1.1 Use Claims for Calypso 480 SC Insecticides on Pome Fruit

Insects Controlled	Insecticide Rate
First generation codling moth and plum curculio	290–440 mL product/ha (140–210 g a.i./ha)
Apple maggot, second generation codling moth and Oriental fruit moth	440 mL product/ha (210 g a.i./ha)
First generation spotted tentiform leafminer and leafhoppers	145 mL product/ha (70 g a.i./ha)
Mullein bug, second and third generation spotted tentiform leafminers	145–290 mL product/ha (70–140 g a.i./ha)

5.1.1.2 Tank-Mix Combinations

Tank mixes with Calypso 480 SC were not proposed or assessed.

5.2 Phytotoxicity to Host Plants

Phytotoxicity to apples was evaluated in six efficacy trials; however, one trial was not reviewed because the timing of assessment was questionable. Of the trials that assessed phytotoxicity, no occurrences were reported.

5.2.1 Acceptable Claims for Host Plants

No phytotoxic effects caused by Calypso 480 SC Insecticide would be expected on any pome fruit; therefore, all crops in the pome fruit group, including apple, crab apple, pear, Oriental pear, loquat, quince and mayhaw, are acceptable.

5.3 Impact on Succeeding Crops

The impact on succeeding crops was not evaluated in this product review.

5.3.1 Acceptable Claims for Rotational Crops

Rotational crops were not assessed in this product review.

5.4 Economics

No market analysis was assessed for this product review.

5.5 Sustainability

5.5.1 Survey of Alternatives

Alternative active ingredients vary depending on the pest. Many of the currently available alternatives are older classes of insecticides, such as carbamates, organophosphates and organochlorines. Other alternatives include the classes synthetic pyrethroids and neonicotinoids as well as growth regulators, pheromones and the protectant kaolin clay. The major alternatives currently registered for control of pests on apple (the major crop of the pome fruit group) are listed in Appendix I, Table 11.

Thiacloprid belongs to the neonicotinoid class of insecticides. Products containing active ingredients in this group are currently registered in Canada, such as Assail (acetamiprid) to control aphids, spotted tentiform leafminer, codling moth and Oriental fruit moth (Ontario only) on pome fruit, and Admire (imidacloprid) to control aphids, mullein bug, spotted tentiform leafminer and white apple leafhopper on apples. For pests that currently have no neonicotinoids registered, thiacloprid could provide a new active ingredient with which to alternate for the prevention of resistance.

5.5.2 Compatibility With Current Management Practices Including Integrated Pest Management

Calypso 480 SC Insecticide offers broad-spectrum insect control when used in pome fruit. It is also compatible with current management practices and conventional crop production systems. Growers are familiar with the monitoring techniques to determine if and when applications are needed.

The effect of thiacloprid on commonly occurring predators and parasitoids of orchards was not assessed; therefore, no claim regarding the acceptability of Calypso 480 SC Insecticide in an integrated pest management system can be made.

5.5.3 Information on the Occurrence or Possible Occurrence of the Development of Resistance

Repeated use of insecticides having the same mode of action in a control program increases the probability of naturally selecting the biotypes, a group of insects within a species that has biological traits that are not common to the population as a whole, with less susceptibility to insecticides of the same mode of action. Therefore, Calypso 480 SC Insecticide should be used in rotation with insecticides that have different modes of action.

The Calypso 480 SC Insecticide label includes the resistance management statements, as per Regulatory Directive DIR99-06, *Voluntary Pesticide Resistance-Management Labelling Based on Target Site/Mode of Action.*

5.5.4 Contribution to Risk Reduction and Sustainability

Thiacloprid controls a broader range of pests compared to currently registered neonicotinoid apple uses. As well, thiacloprid can be used on all crops in the pome fruit group. Thiacloprid is the first neonicotinoid registered for control of apple maggot and plum curculio. For these pests, thiacloprid is a new active ingredient with which to rotate for resistance management. Prudent use of insecticides in this class should be observed to prevent the development of resistance because acetamiprid and imidacloprid are already registered for use on pome fruit. Many of the pests on the Calypso 480 SC Insecticide label are controlled by older chemistries such as organophosphates, organochlorines and carbamates. As such, thiacloprid is considered to be an organophosphate replacement.

Thiacloprid is not toxic to bees, birds or fish, while several of the alternative products are toxic to these organisms. It is toxic to beneficial arthropods other than bees, but this is also the case for some of the alternatives. Thiacloprid does not require a buffer zone for terrestrial habitats, while some of the alternatives do. The buffer zones required to protect aquatic habitats are, in some cases, smaller than those for the alternatives. Some of the alternatives (malathion, cypermethrin and permethrin) contain a petroleum distillate formulant, which is toxic to aquatic organisms. Thiacloprid does not contain such a formulant. However, thiacloprid itself is toxic to aquatic organisms. Thiacloprid has less potential to leach to groundwater than does imidacloprid, another nenonicotinoid insecticide registered for use on apples.

6.0 Toxic Substances Management Policy Considerations

The management of toxic substances is guided by the federal government's Toxic Substances Management Policy (TSMP), which puts forward a preventive and precautionary approach to deal with substances that enter the environment and could harm the environment or human health. The policy provides decision makers with direction and sets out a science-based management framework to ensure that federal programs are consistent with its objectives. One of the key management objectives is virtual elimination from the environment of toxic substances that result predominantly from human activity and that are persistent and bioaccumulative. These substances are referred to in the policy as Track 1 substances.

While reviewing thiacloprid, the PMRA took into account the TSMP and followed its Regulatory Directive DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*. Substances associated with the use of thiacloprid were also considered, including major transformation products formed in the environment, microcontaminants in the technical grade product and formulants in the end-use product Calypso 480 SC Insecticide. The PMRA has reached the following conclusions:

- Thiacloprid does meet the criteria for persistence. Its values for half-life in water (26 days) and soil (30 days) are below the TSMP Track 1 cut-off criteria for water (≥ 182 days) and soil (≥ 182 days); however, its value for sediment (> 360 days) can be considered as meeting the cut-off criteria for sediment (≥ 365 days). Thiacloprid is not bioaccumulative; the *n*-octanol–water partition coefficient (log K_{ow}) is 1.26, which is below the TSMP Track-1 cut-off criterion of ≥ 5.0. Because thiacloprid does not meet all Track 1 criteria, it is not classified as a Track 1 substance.

- YRC 2894-amide formed in soil and water does meet the criterion for persistence (longest half-life in soil is 224 days) and bioaccumulation (log K_{ow} = 5.4). Its toxicity can only be partially evaluated as the only organisms tested with this compound were rats, chironomids, amphipods, rainbow trout and bluegill sunfish. No risks were identified to these organisms; therefore, the TSMP criterion for toxicity is considered unmet, and YRC 2894-amide cannot be classified as a Track 1 substance.

- YRC 2894-sulfonic acid formed in soil does not meet the criterion for persistence in soil (half-life $\leq$ 77 days) nor does it meet the criterion for bioaccumulation (log $K_{ow} < 1$). Because YRC 2894-sulfonic acid does not meet all Track 1 criteria, it is not classified as a Track 1 substance.

- Technical grade thiacloprid does not contain any contaminants of health or environmental concern identified in the *Canada Gazette*, Part II, Volume 139, Number 24, pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern.*

- The end-use product Calypso 480 SC Insecticide does not contain any formulants of health or environmental concern identified in *Canada Gazette*, Part II, Volume 139, Number 24, pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern.*

Therefore, the use of thiacloprid is not expected to result in the entry of Track 1 substances into the environment.

7.0 Summary

7.1 Human Health and Safety

The toxicology database submitted for thiacloprid is adequate to define the majority of toxic effects that may result from human exposure to thiacloprid. In subchronic and chronic studies on laboratory animals, target organs included the thyroid gland, liver, adrenal gland, testes and prostate gland. There was evidence of carcinogenicity based on an increased incidence of thyroid follicular cell adenomas and uterine tumours in rats and ovarian luteomas in mice after two years of dosing. There was no evidence of increased susceptibility of the young in reproductive toxicity and teratology studies. A lack of brain morphometric measurements in offspring from intermediate dose groups in the developmental neurotoxicity study leads to some uncertainty regarding potential the prenatal and postnatal neurotoxicity of thiacloprid.

Acceptable margins of exposure and cancer risk levels were obtained for mixers, loaders, applicators and re-entry workers.

An aggregate exposure assessment (dietary + residential) was conducted for thiacloprid as there is potential for occasional acute exposures to adults and children while harvesting apples at pick-your-own commercial operations. Acceptable margins of exposure were achieved for the aggregate exposure and risk assessment.

The nature of the residue in plants and animals is adequately understood. The residue definition is the combined residues of thiacloprid and metabolites retaining the thiazolidine ring intact, measured and expressed in terms of thiacloprid, per se. The proposed use of thiacloprid on pome fruit does not constitute an unacceptable chronic or acute dietary risk (food and drinking water) to any segment of the population, including infants, children, adults and seniors. The cancer risk for the total population (food and water) is considered acceptable (2.15×10^{-6}). Sufficient crop residue data have been reviewed to recommend maximum residue limits to protect human health. The PMRA recommends that the following maximum residue limits be specified under the authority of the *Pest Control Products Act*:

- residues of thiacloprid in and on pome fruit (crop group 11) (0.3 ppm);
- liver of cattle, sheep, goat and horse (0.15 ppm);
- kidney of cattle, sheep, goat and horse (0.05 ppm);
- fat of cattle, sheep, goat and horse (0.02 ppm);
- meat of cattle, sheep, goat and horse (0.03 ppm);
- meat byproducts of cattle, sheep, goat and horse (0.05 ppm); and
- milk (0.03 ppm).

7.2 Environmental Risk

Thiacloprid and its major transformation products in the environment (YRC 2894-amide and YRC 2894 sulfonic acid) present a low risk to wild mammals, birds, earthworms, bees, terrestrial plants, fish, amphibians, algae and aquatic plants. However, given that thiacloprid is an insecticide, it is expected to adversely affect terrestrial insects other than bees, as well as insects living in freshwater habitats in areas adjacent to application. It is also expected to adversely affect other freshwater and marine invertebrates. Therefore, specific instructions to reduce spray drift to terrestrial insects are provided on the product label. Also, buffer zones of 5 to 30 metres (depending on timing of application) are required to protect nearby freshwater and estuarine/marine habitats from spray drift.

7.3 Value

The data submitted to register Calypso 480 SC Insecticide are adequate to describe its efficacy for use in pome fruit. Calypso 480 SC Insecticide offers control of a variety of insect pests when applied according to the timing identified on the label.

7.4 Unsupported Uses

The PMRA supports all the uses originally proposed in this application, with a maximum rate of 420 g a.i./ha/year.

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act*, is proposing full registration for the sale and use of the technical grade active ingredient thiacloprid and the end-use product Calypso 480 SC Insecticide to control various insects on pome fruit. An evaluation of current scientific data from the applicant, scientific reports and information from other regulatory agencies has resulted in the determination that, under the proposed conditions of use, the end-use product has value and does not present an unacceptable risk to human health or the environment.

List of Abbreviations

1/n	exponent for the Freundlich isotherm
µg	microgram
a.i.	active ingredient
ADI	acceptable daily intake
ARfD	acute reference dose
ARTF	Agricultural Reentry Exposure Task Force
ASE	accelerated solvent extraction
AUC	area under the curve
bw	body weight
CAS	chemical abstracts service
CI	confidence interval
cm	centimetres
d	day
DACO	data code
DF	dry flowable
DNA	deoxyribonucleic acid
DT_{50}	dissipation time 50% (the dose required to observe a 50% decline in the test population)
DT_{75}	dissipation time 75% (the dose required to observe a 75% decline in the test population)
EC_{10}	effective concentration on 10% of the population
EC_{25}	effective concentration on 25% of the population
EEC	estimated environmental concentration
EXAMS	Exposure Analysis Modeling System
F	female
F_1	first filial generation
F_2	second filial generation
g	gram
GD	growth day
ha	hectare(s)
HAFT	highest average field trial
HDT	highest dose tested
HPLC	high performance liquid chromatography
IUPAC	International Unionn of Pure and Applied Chemistry
kg	kilogram
K_d	soil-water partition coefficient
K_F	Freundlich adsorption coefficient
K_{oc}	organic-carbon partition coefficient
K_{ow}	*n*-octanol– water partition coefficient
LC_{50}	lethal concentration 50%
LD_{50}	lethal dose 50%
LEACHM	Leaching Estimation and Chemistry Model
LOAEL	lowest observed adverse effect level
LOD	level of detection

LOQ	limit of quantitation
LR_{50}	lethal rate 50%
m/z	mass to charge ratio
M	male
MAS	maximum average score
mg	milligram
mL	millilitre
MOE	margin of exposure
MRL	maximum residue limit
MS	mass spectrometry
N/A	not applicable
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
NOER	no observed effect rate
NZW	New Zealand white
OC	organic carbon content
OECD	Organisation for Economic Co-operation and Development
OM	organic matter content
P	parental generation
PHED	Pesticide Handlers Exposure Database
PHI	preharvest interval
pKa	dissociation constant
PMRA	Pest Management Regulatory Agency
PND	postnatal day
ppm	parts per million
PRZM	Pesticide Root Zone Model
Q_1*	unit risk
RSD	relative standard deviation
RQ	risk quotient
SC	soluble concentrate
SD	Sprague Dawley
SF	safety factor
$t_{1/2}$	half-life
T3	tri-iodothyronine
T4	thyroxine
TRR	total radioactive residue
TSMP	Toxic Substances Management Policy
UAN	urea ammonium nitrate
UF	uncertainty factor
USEPA	United States Environmental Protection Agency
UV	ultraviolet
v/v	volume per volume dilution

Appendix I Tables

Table 1 Residue Analysis

Matrix	Method ID	Analyte	Method Type	LOQ	Reference
Plant	573	Thiacloprid, thiacloprid-amide, hydroxy-thiacloprid-amide.	HPLC-MS/MS	0.02 ppm in plant matrices	1044179
	Modified 573	Thiacloprid, thiacloprid-amide, hydroxy-thiacloprid-amide.	HPLC-MS/MS[1]	0.01 ppm in plant matrices	1144181
Animal	490	Thiacloprid	HPLC-MS/MS	0.01 ppm in milk 0.02 ppm in animal tissues	1044175
Soil	440	Thiacloprid, thiacloprid-amide, thiacloprid-sulfonic acid	HPLC-MS/MS	0.01 ppm in soil matrices	1043905
Sediment	467	Thiacloprid	HPLC-UV	0.01 ppm in sediment matrices	1043909
Water	411	Thiacloprid, thiacloprid-sulfonic acid	HPLC-UV	0.01 ppm in water matrices	1043910
	460	Thiacloprid-amide	HPLC-UV	0.01 ppm in water matrices	1043911

[1] Thiacloprid transitions: 253 to 126 or 186 m/z
Thiacloprid-amide transitions: 271 to 126 or 228 m/z
Hydroxy-thiacloprid-amide transitions: 287 to 126 or 244 m/z

Table 2 Acute Toxicity of Thiacloprid Technical Insecticide (YRC 2894), Its Metabolites and Its Associated End-Use Product (Calypso 480 SC Insecticide)

Study Type	Species	Result	Comment
Acute Toxicity of Thiacloprid Technical			
Oral	Rat (Wistar)	LD_{50} (M) = 621 mg/kg bw LD_{50} (F) = 396 mg/kg bw	High toxicity
Oral	Rat (Wistar)	LD_{50} (M) = 836 mg/kg bw LD_{50} (F) = 444 mg/kg bw	High toxicity
Oral	Mouse (CD-1)	LD_{50} (M) = 127 mg/kg bw LD_{50} (F) = 147 mg/kg bw	High toxicity
Dermal	Rat (Wistar)	LD_{50} > 2000 mg/kg bw	Low toxicity
Inhalation	Rat (Wistar)	LC_{50} (M) > 1.52 mg/L LC_{50} (F) = 0.48–1.52 mg/L	Slight toxicity

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Dermal	Rat (Wistar)	LD_{50} > 2000 mg/kg bw	Low toxicity
Inhalation	Rat (Wistar)	LC_{50} (M) > 1.52 mg/L LC_{50} (F) = 0.48–1.52 mg/L	Slight toxicity

Study Type	Species	Result	Comment
Skin Irritation	Rabbit (NZW)	MAS[a] = 0.6	Slightly irritating
Eye Irritation	Rabbit (NZW)	MAS = 0.89	Minimally irritating
Skin Sensitization (maximization)	Guinea pig	Equivocal	Potential dermal sensitizer
Acute Toxicity of Metabolites			
Oral—KKO 2254	Rat (Wistar)	$LD_{50} > 2000$ mg/kg bw	Low toxicity
Oral—WAK 6999	Rat (Wistar)	$LD_{50} > 2000$ mg/kg bw	Low toxicity
Oral—2-cyanimino -1,3-thiazolidin (intermediate)	Rat (Wistar)	$LD_{50} = 300–500$ mg/kg bw	High toxicity
Acute Toxicity of End-Use Product: Calypso 480 SC Insecticide			
Oral	Rat (Wistar)	$LD_{50} = 300–500$ mg/kg bw	High toxicity
Dermal	Rat (Wistar)	$LD_{50} > 4000$ mg/kg bw	Low toxicity
Inhalation	Rat (Wistar)	LC_{50} (M) > 2.7 mg/L LC_{50} (F) = 1.2–2.7 mg/L	Slight toxicity
Skin Irritation	Rabbit (Himalayan)	MAS = 0	Non-irritating
Eye Irritation	Rabbit (Himalayan)	Irritation scores all 0	Non-irritating
Skin Sensitization (Buehler)	Guinea pig	Negative	Study considered unacceptable.
Skin Sensitization (Buehler)	Guinea pig	Negative	Study considered acceptable.
Skin Sensitization (maximization)	Guinea pig	Positive	Potential dermal sensitizer.

[a] MAS = Maximum average score for 24, 28 and 72 hours

Table 3 Toxicity Profile of Thiacloprid Technical Insecticide

Study Type	Species	Results[a]
4-week oral gavage 2-Cyanimino-1,3-thiazolidin (intermediate in chemical synthesis)	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (study conducted on intermediate). Effects noted at 15 mg/kg bw/day (LDT) included elevated levels of serum triglycerides, increased incidence and size of germinal centres of splenic lymph follicles (M), decreased motor activity (M), decreased locomotor activity (F).

Study Type	Species	Results[1]
4-week dermal	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (some target tissues were not examined histologically). Effects noted in males at 100 mg/kg bw/day (LDT) included minimal to moderate centrilobular hypertrophy in the liver in combination with a more homogeneously structured cytoplasm. Effects were noted in both sexes at 1000 mg/kg bw/day (HDT) and included clinical signs (F), increased liver weight, thyroid follicular cell hypertrophy, colloid vacuolation and foamy cytoplasm in the thyroid (M) and minimal to moderate centrilobular hypertrophy in the liver.
1-week inhalation Reflexes, grip strength, thyroid hormones and liver enzyme induction examined	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding study). No effects were noted at 0.54 mg/kg bw/day. Effects at the next highest dose (4.94 mg/kg bw/day) included increased forelimb grip strength and black spleen (F).
4-week inhalation Reflexes, thyroid hormones and liver enzyme induction assessed	Rat (Wistar)	**NOAEL:** 4.94 mg/kg bw/day. **LOAEL:** 38.9 mg/kg bw/day; piloerectiom, bradypnea, reduced motility, ungroomed haircoat, mydriasis, miosis, tremors, reduced tonus, impaired pupillary reflex, hypothermia, decreased body weight, decreased lymphocyte counts (F), elevated levels of serum phosphate (M), increased serum cholesterol levels (F), increased serum levels of alkaline phosphatase (F), increased serum bile acids (F), increased serum levels of T3 and T4 (F), increased liver and thyroid weight, slight hypertrophy of the thyroid follicular epithelium (M), minimal to slight hepatocellular hypertrophy, minimal fat deposition in the liver (F), induction of Phase I liver enzymes.
2-week oral gavage Thyroid hormones and liver enzyme induction assessed	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding) No effects were noted at 20 mg/kg bw/day. Effects at the next highest dose (60 mg/kg bw/day) included reduced defecation (F), decreased body weight and body-weight gain, slight elevation in serum alkaline phosphatase (F), increased serum cholesterol, histopathological changes (not further defined) in the hepatocyte cytoplasm (F) and decreased spleen weight.
2-week dietary Focus on liver and thyroid toxicity	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (non-guideline study). Minimal effects considered non-adverse were noted in females at 2.3 mg/kg bw/day. Effects at the next highest dose (11.2/9.6 mg/kg bw/day in M/F) included a slight reduction in body-weight gain (F), elevated levels of serum cholesterol and bile acids, lobulation of the liver surface (F), and induction of Phase I and Phase II liver enzymes.

Study Type	Species	Results[a]
3-week dietary Focus on thyroid toxicity	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (non-guideline study). No effects were noted at 9.0/12.3 mg/kg bw/day in M/F. Effects at the next highest dose (36.9/44.6 mg/kg bw/day in M/F) included induction of UDP-glucuronyl transferase, elevated serum levels of TSH (M), increased liver weight (M) and decreased thyroid weight (F).
4-week dietary Focus on mechanism of aromatase induction and toxicokinetics	Rat (Wistar)	A NOAEL and LOAEL were not established as this study was considered supplemental (non-guideline study). Effects noted at 6.7/6.6 mg/kg bw/day in M/F (LDT) included decreased body weight (M) and food consumption (M), and an increase in the plasma level of thiacloprid in females over time while the plasma levels in males remained constant. Hepatic aromatase activity was increased in females at the next highest dose (20.4 mg/kg bw/day). There was no increase in ovarian aromatase activity up to 60.4 mg/kg bw/day (HDT).
3-month dietary Thyroid hormones and liver enzyme induction assessed	Rat (Wistar)	**NOAEL:** 7.3/7.6 mg/kg bw/day in M/F **LOAEL:** 28.6/35.6 mg/kg bw/day in M/F; moderate hepatocellular hypertrophy associated with a fine granular to vesicular structure of the perinuclear cytoplasm and induction of Phase I and Phase II liver enzymes.
2-week dietary Focus on liver toxicity	Mouse (B6C3F1)	A NOAEL and LOAEL were not established as this study was considered supplemental (non-guideline study). Effects noted at 22/30 mg/kg bw/day in M/F (LDT) included slight induction of Phase I and Phase II liver enzymes.
3-week dietary	Mouse (B6C3F1)	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding study). No effects were noted at 30/64 mg/kg bw/day in M/F. Effects noted at the next highest dose (368/559 mg/kg bw/day in M/F) included increased liver weight.
3-month dietary Immunohistochemical examination of prolactin performed on the pituitary gland of females Liver enzyme induction assessed	Mouse (B6C3F1)	**NOAEL (M):** 103 mg/kg bw/day. **LOAEL (M):** 542 mg/kg bw/day; increased food consumption and decreased food conversion efficiency, elevated levels of serum bilirubin, increased liver weight, decreased kidney weight, moderate hepatocellular hypertrophy and induction of Phase I liver enzymes. **NOAEL (F):** not established. **LOAEL (F):** 27 mg/kg bw/day (LDT); increased severity of fatty vacuolation of the adrenal X-zone.

Study Type	Species	Results[a]
3-month dietary Focus on mechanism of aromatase induction in female mice	Mouse (B6C3F1)	A NOAEL and LOAEL were not established as this study was considered supplemental (non-guideline study). No effects were noted at 18 mg/kg bw/day. Effects noted at the next highest dose (139 mg/kg bw/day) included increased hepatic aromatase activity, increased severity of X-zone vacuolation of the adrenal gland. Co-administration of mecamylamine (a nicotine mimicking agent) in drinking water did not reduce effects on the adrenal gland, indicating that adrenal affects may not be due to nicotinic action.
10-week dietary Thyroid hormones assessed	Dog	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding study). No effects were noted at 9.6 mg/kg bw/day. Effects noted at the next highest dose (66 mg/kg bw/day) included decreased food consumption, decreased body weight (F), slight cytoplasmic changes in hepatocytes, decreased serum levels of T4 (F) and increased prostate weight.
15-week dietary Thyroid hormones and liver enzyme induction assessed.	Dog	**NOAEL:** not established **LOAEL:** 8.5/8.9 mg/kg bw/day in M/F (LDT); decreased T4 (F), elevated TBC, increased liver weight, increased testes weight and increased prostate secretory activity.
1-year dietary Thyroid hormones and liver enzyme induction assessed.	Dog	**NOAEL:** 8.9/8.3 mg/kg bw/day in M/F **LOAEL:** 34.4/33.8 mg/kg bw/day in M/F; slightly reduced food consumption (F), increased prostate weight, hepatocellular cytoplasmic change (M), tubular hypoplasia in the testes and increased severity of pigmentation in the proximal tubules of the kidneys.
Carcinogenicity (2-year dietary) Thyroid hormones and liver enzyme induction assessed.	Rat (Wistar)	**NOAEL:** 1.2/1.6 mg/kg bw/day in M/F **LOAEL:** 2.5/3.3 mg/kg bw/day in M/F; hepatocellular hypertrophy and cytoplasmic change in the liver (M), mixed eosinophilic/clear cell focus in the liver (M), thyroid follicular epithelial hypertrophy (M), retinal atrophy (F), and induction of Phase I and II liver enzymes. Evidence of carcinogenicity based on increased incidence of thyroid follicular cell adenomas and uterine tumours (adenomas, adenocarcinomas and adenosquamous carcinomas).
Carcinogenicity (2-year dietary)	Mouse (B6C3F1)	**NOAEL:** 5.7/10.9 mg/kg bw/day in M/F **LOAEL:** 234/475 mg/kg bw/day in M/F; elevated leukocyte counts, increased liver weight, slight to minimal centrilobular hepatocellular hypertrophy, centrilobular fatty change in the liver (M), centrilobular hepatocellular degeneration (M) and mesenteric lymph node vacuolation. Evidence of carcinogenicity based on increased incidence of benign and malignant ovarian luteomas.

Study Type	Species	Results[a]
Developmental toxicity	Rat (Wistar)	**Maternal NOAEL:** 10 mg/kg bw/day **Maternal LOAEL:** 50 mg/kg bw/day; decreased fecal output, changes in water consumption and urination, decreased body weight during dosing, decreased body-weight gain during gestation with a greater decrease during dosing, decreased body-weight gain after correcting body weight for gravid uterus weight, decreased gravid uterus weight, reduced food consumption, one complete litter resorption, increased late resorptions and increased postimplantation loss. **Developmental NOAEL:** 10 mg/kg bw/day **Developmental LOAEL:** 50 mg/k bw/day; reduced number of fetuses in each litter, decreased fetal body weight, necrotic placental border, bilateral dysplasia of the humerus, radius and scapula, skeletal retardations (distal and proximal phalanx digits, distal phalanx toes, parietal bone, thoracic and cervical vertebral bodies, caudal vertebral arches, interparietal bone, supraoccipital bone, metacarpals, thoracic vertebral bodies), asymmetrical sternebrae, wavy ribs, enlarged fontanelle and reduced presence of cervical bodies and caudal vertebral arches.
Developmental toxicity	Rabbit (Himalayan)	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding study). No maternal effects were noted at 10 mg/kg bw/day. Maternal effects noted at the next highest dose (30 mg/kg bw/day) included slightly reduced food intake, decreased fecal output and loss of body weight during the first days of dosing. No developmental effects were noted at 30 mg/kg bw/day. Developmental effects noted at the next highest dose (40 mg/kg bw/day) included a marginal decrease in fetal body weight.
Developmental toxicity	Rabbit (Himalayan)	**Maternal NOAEL:** 2 mg/kg bw/day **Maternal LOAEL:** 10 mg/kg bw/day; loss of body weight, reduced water consumption and urination, discoloured urine, decreased fecal output and decreased food consumption. **Developmental NOAEL:** 2 mg/kg bw/day **Developmental LOAEL:** 10 mg/kg bw/day; decreased body weight in female fetuses.

Study Type	Species	Results[a]
One-generation reproduction	Rat (SD)	**Parental NOAEL (M):** 69 mg/kg bw/day **Parental LOAEL (M):** > 69 mg/kg bw/day **Parental NOAEL (F):** 23 mg/kg bw/day **Parental LOAEL (F):** 75 mg/kg bw/day; mortalities (found dead or sacrificed in extremis) in pregnant females, clinical signs (paleness, laboured breathing, cold to the touch, hypoactivity, salivation), decreased body weight during premating, gestation and lactation, decreased body-weight gain during premating and gestation and increased liver and thyroid weights. **Offspring NOAEL:** 20/23 mg/kg bw/day in M/F **Offspring LOAEL:** 69/75 mg/kg bw/day in M/F; increased pup deaths from PND 0 to 4, weakened state, reduced viability index, decreased mean litter size, and reduced body weight and body-weight gain on PND 4. **Reproductive NOAEL:** 20/23 mg/kg bw/day in M/F **Reproductive LOAEL:** 69/75 mg/kg bw/day in M/F; dystocia, increased stillbirths, decreased gestation index, a reduction in the number of dams with implantations and in the number of implantation sites per dam.
Two-generation reproduction	Rat (SD)	A NOAEL and LOAEL were not established as this study was considered supplemental (range-finding study). No parental effects were noted at 100 ppm (LDT). Parental toxicity was noted at 400 ppm (dose in mg/kg bw/day not provided) in the form of hepatocyte hypertrophy in one female and thyroid follicular cell hypertrophy in one male. No offspring effects were noted at 400 ppm. Offspring toxicity was noted at 1600 ppm in the form of increased pup deaths from PND 0 to 4, decreased viability index, decreased body weight from PND 4 to 35, reduced body-weight gain from PND 0 to 35, hepatocyte hypertrophy, "ground/glassy-like appearance" of hepatocyte cytoplasm, increased mitotic figures in the liver, thyroid follicular cell hypertrophy and thyroid follicular cells with macrophages (F).

Study Type	Species	Results[a]
Two-generation reproduction	Rat (SD)	**Parental NOAEL:** 3.5/4.2 mg/kg bw/day in M/F **Parental LOAEL:** 21/26 mg/kg bw/day in M/F; mortalities (found dead or sacrificed in extremis) in pregnant females of first generation, paleness and stained/wet ventrum (F) in first generation, increased liver and thyroid weight in both generations, hepatocytomegaly in both generation, liver necrosis (F) in first generation and thyroid follicular cell hypertrophy in both generations. **Offspring NOAEL:** 3.5/4.2 mg/kg bw/day in M/F. **Offspring LOAEL:** 21/26 mg/kg bw/day in M/F; decreased pup body weights from PND 14 to 21 in both generations. **Reproductive NOAEL:** 3.5/4.2 mg/kg bw/day in M/F. **Reproductive LOAEL:** 21/26 mg/kg bw/day in M/F; dystocia and one complete litter loss in first generation.
Acute neurotoxicity	Rat (F344)	**NOAEL (M):** 11 mg/kg bw **LOAEL (M):** 21 mg/kg bw; tremors, ptosis of the eyelids and no reaction upon approach on the day of dosing. **NOAEL (F):** 3.1 mg/kg bw **LOAEL (F):** 11 mg/kg bw; decreased motor and locomotor activity on the day of dosing.
Short-term neurotoxicity (90-day dietary)	Rat (F344)	**NOAEL:** 24.2/27.9 mg/kg bw/day in M/F **LOAEL:** 101/115 mg/kg bw/day in M/F; decreased body weight, body-weight gain and food consumption; decreased hindlimb grip strength (M).
Developmental neurotoxicity	Rat (SD)	**Maternal NOAEL:** 4.4 mg/kg bw/day **Maternal LOAEL:** 26 mg/kg bw/day; decreased body weight, body-weight gain and food consumption during gestation. **Developmental NOAEL:** 4.4 mg/kg bw/day **Developmental LOAEL:** 25.6 mg/kg bw/day; decreased pup body weight from PND 8 to 22 and after weaning, decreased pup body-weight gain during lactation and delay in sexual maturation (M).
Reverse gene mutation (3 studies)	*Salmonella typhimurium*, *E. Coli*	Negative in all 3 studies
Bacterial DNA damage/repair	*Bacillus subtilis*	Negative
In vitro forward gene mutation	Chinese hamster lung cells	Negative
In vitro mammalian chromosomal aberration	Chinese hamster lung cells	Negative
In vivo mammalian cytogenetics	Mouse micronucleus assay	Negative. Study considered non-guideline as only one dose was used.

Study Type	Species	Results[a]
In vitro unscheduled DNA synthesis	Primary rat hepatocytes	Negative
Reverse gene mutation with KKO 2254 (amide metabolite)	*Salmonella typhimurium*	Negative
Reverse gene mutation with WAK 6999 (sulfonic acid metabolite)	*Salmonella typhimurium*	Negative
Metabolism	Rat (Wistar)	**Absorption**—Approximately 60–84% of the thiacloprid administered orally was absorbed from the gastrointestinal tract. Absorption was rapid, with peak plasma concentrations occurring 1 to 2 hours after administration of the low dose and 3 to 4 hours after administration of the high dose. **Distribution**—Distribution to tissues was rapid and extensive. Tissue burdens were minimal with the gastrointestinal tract, liver and skin exhibiting the highest concentrations. Thiacloprid does not appear to have a potential to accumulate in the body. **Excretion**—Excretion occurred primarily via the urine and was rapid following the low dose (over 90% complete at 24 hours), but slower following the high dose (44–71% complete at 24 hours). Excretion was lower following repeated dosing when compared to administration of a single dose. Females generally showed a slower rate of excretion when compared to males. **Metabolism**—Metabolism was extensive, with only 1-6% of the administered thiacloprid remaining intact in the urine and feces. The major metabolite following administration of [methylene-^{14}C] thiacloprid was WAK 3583 (11–34% in urine). The primary metabolites identified following administration of [thiazolidine-4,5-^{14}C] thiacloprid were PIZ 1241D, PIZ 1250, PIZ 1243 and PIZ 1249 (1–22% in urine). Minor sex-related quantitative differences in some metabolite profiles were observed. There were no sex-related differences in the amount of the major metabolites WAK 3583, PIZ 1250, or PIZ 1249. The amount of PIZ 1243 was 4 times higher in females compared to males, while the amount of PIZ 1241D was 2 times higher in males than in females.
Special non-guideline study assessing toxicokinetics in pregnant and non-pregnant rats	Rat (SD)	Plasma levels of thiacloprid were higher in pregnant rats from GD 7 to 21 when compared to non-pregnant rats after dosing in the diet during mating and gestation. Results from this study indicate that pregnant rats may have slower or less complete clearance of thiacloprid than non-pregnant rats.

Study Type	Species	Results[a]
Special non-guideline reproduction study on dystocia	Rat (SD)	Gavage administration of thiacloprid (50–100 mg/kg bw/day) to pregnant rats from GD 18 to 20 resulted in mortality (found dead or sacrificed in extremis) during delivery, dystocia (attributed to necrosis of uterine horn which contained pups at necropsy), clinical signs (nasal staining, reduced fecal output, hypoactivity, tremors, laboured breathing, cold to touch) and decreased body weight on GD 19 and 20.
Special non-guideline reproduction study on dystocia	Rat (SD)	Gavage administration of thiacloprid (35 mg/kg bw/day) to pregnant rats from GD 18 to 21 resulted in mortality between GD 20 and 24, hypoactivity, chromorhinorrhea, clear vaginal discharge, decreased body weight on GD 21, loss of body weight, reduced food consumption, increased stillbirths, a reduction in the mean number of viable pups per litter and a decrease in the live birth index.
Special study to further examine the increased occurrence of dystocia and stillbirths	Rat (SD)	Dietary administration of thiacloprid (54/61 mg/kg bw/day in M/F) to male and female rats for 10 weeks prior to mating and to female rats during gestation resulted in the following effects in females: mortality during premating and on GD 23 and 24; dystocia; decreased body-weight gain during premating and gestation; elevated hormone levels (LH, 17β-estradiol, corticosterone, progesterone) during premating on GD 18 and on LD 2; increased liver weight during premating and on GD18; centrilobular hepatocellular hypertrophy; and induction of Phase I liver enzymes during premating on GD 18 and on LD 2.
Special study to investigate the cause of dystocia and stillbirth in rats	Rat (SD)	Dietary administration of thiacloprid (62/73 mg/kg bw/day) to male and female rats for 10 weeks prior to mating and to female rats during gestation resulted in mortality among female rats from GD 15 to 22, decreased body weight during premating (F), decreased body-weight gain (F) and reduced number of fetuses per litter. Mechanistic investigations (cervical collagen concentration, cervical extensibility, uterine contractility, EMG recordings and intrauterine pressure, uterine alpha-1 adrenergic receptor levels, cervical wet/dry weight, histological evaluation of cervix and uterus) did not reveal any treatment-related effects.
Special study to determine aromatase activity in ovary and liver tissue in a modified 1-generation reproduction study	Rat (SD)	Dietary administration of thiacloprid (61 mg/kg bw/day) to female rats for 10 weeks prior to mating and during gestation resulted in increased hepatic aromatase activity during premating, as determined by a "tritiated water assay". Ovarian aromatase activity was comparable to controls during premating and at GD 18; at LD 2, the results were considered equivocal.
Special study to investigate the inhibition of thyroid peroxidase-catalyzed in vitro reactions	Thyroid peroxidase obtained from domestic hog thyroid glands	Thiacloprid did not inhibit thyroid peroxidase-catalyzed reactions (guaiacol oxidation and iodine formation). In addition, plasma samples from control and thiacloprid-dosed rats did not inhibit thyroid peroxidase-catalyzed reactions.

Study Type	Species	Results[a]
Special study to investigate the inhibition of cytochrome P450 dependent monooxygenases in liver microsomes	Thiacloprid was co-incubated with: a) 7-ethoxy-coumarin and liver microsomes to examine inhibition of 7-ethoxy-coumarin deethylase b) testosterone and liver microsomes to examine the inhibition of testosterone hydroxylation	Thiacloprid was a very weak inhibitor of 7-ethoxycoumarin deethylase. Thiacloprid did not show potency for the inhibition of testosterone hydroxylation. Hepatic microsomes from female rats dosed with 1000 ppm thiacloprid in the diet for 2 weeks appeared to increase the metabolism of testosterone to androstendione.

[a] Effects observed in males and females unless otherwise reported.

Table 4 Toxicology Endpoints for Use in Health Risk Assessment for Thiacloprid

Exposure Scenario	Dose (mg/kg bw/day)	Study	Endpoint	Target MOE
Acute dietary, all populations	NOAEL = 3.1	Acute neurotoxicity study in rats	Decreased motor and locomotor activity	N/A
	ARfD = 0.01 mg/kg bw (based on the NOAEL of 3.1 mg/kg bw and an UF/SF of 300)			
Chronic dietary, all populations	NOAEL = 1.2	2-year dietary study in rats	Liver enzyme induction, liver and thyroid pathology, retinal atrophy	N/A
	ADI = 0.004 mg/kg bw/day (based on the NOAEL of 1.2 mg/kg bw/day and an UF/SF of 300)			
Short-term dermal	NOAEL = 2.3	2-week dietary study (focus on liver and thyroid toxicity)	Increased serum cholesterol and bile acids, lobulation of the liver surface and liver enzyme induction	300
Short-term inhalation	NOAEL = 4.9	4-week inhalation study in rats	Clinical signs, clinical chemistry (increased serum phosphate, cholesterol, bile acids), increased T3 and T4, increased liver and thyroid weight, thyroid and liver pathology, liver enzyme induction	300
Intermediate-term dermal	NOAEL = 1.2	2-year dietary study in rats	Liver enzyme induction, liver and thyroid pathology, retinal atrophy	300
Cancer unit risk	$Q_1^* = 3.79 \times 10^{-2}$ (mg/kg bw/day)$^{-1}$	2-year dietary study in the rat	Uterine adenoma, adenocarcinoma and adenosquamous carcinoma	N/A

Table 5 Integrated Food Residue Chemistry Summary

NATURE OF THE RESIDUE IN APPLE		Reference: 1043780
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied uniformly to 50 apples	
Rate	53 µg a.i./apple/application, 2 applications with 14-day interval	
End-use product	Soluble concentrate (600 SC)	
Preharvest interval	14 days	

Over 84% of the TRR in treated apples was removed by surface washing with dichloromethane, and an additional 13% of the TRR was released by extraction with methanol and water. Translocation study showed the majority of the residues remained in/on the leaves (77–84% TRR) with < 0.1% of the TRR detected in/on apples. Based on the metabolism study, the predominant residue in apple is thiacloprid.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Apple	Thiacloprid (YRC 2894)	Thiacloprid-amide 4-hydroxy-thiacloprid

NATURE OF THE RESIDUE IN TOMATO		Reference: 1043781, 1043782
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied to tomatoes including the surrounding leaves, stems and plant stalk	
Rate	0.79 mg a.i./plant/application, 2 applications with 14-day interval	
End-use product	Soluble concentrate (600 SC)	
Preharvest interval	14 days	

Approximately 84–96% of the TRR in tomatoes was removed by washing with methanol. An additional 4–14% of the TRR was released by extraction the washed tomatoes with methanol. There was no translocation of radioactivity into the tomato fruit by uptake from the soil through the roots. Based on the metabolism study, the predominant residue in tomato is thiacloprid.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Tomato	Thiacloprid (YRC 2894)	4-hydroxy-thiacloprid, 6-chloronicotinic acid (6-CNA), 6-chloropicolylalcohol glucoside, complex 6-chloropicolyl alcohol (6-CPA) glucoside

NATURE OF THE RESIDUE IN COTTON		Reference: 1043783
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied uniformly to cotton plants	

Rate	3 mg a.i./plant/application (simulating 125 g a.i./ha), 3 applications with 7-day interval
End-use product	Soluble concentrate (480 SC)
Preharvest interval	120 days. Leaves and petals cropped to the ground were collected throughout the study

Total radioactive residues were 1.12 ppm (undelinted seed), 3.21 ppm (gin byproducts), 30.35 ppm (dropped leaves/petals) and 0.06 ppm (lint). In cotton seed, the major residue identified was 6-CNA (45.8% of the TRR), thiacloprid was identified as a minor metabolite (0.6% of the TRR). The applicant proposed that the high levels of 6-CNA in cotton seed is a secondary metabolite taken from the leaves.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Cotton seed	6-CNA, 6-CNA conjugates, 6-CNA based compounds	Thiacloprid, 6-CPA conjugates
Cotton gin byproducts	Thiacloprid	6-CNA, 4-OH-YRC 2894, 4-OH-KKO 2254, 6-CPA, 6-CPA glucoside, 6-CPA glucosylpentoside, 6-CPA glucosylphosphate/sulfate, thiacloprid sulfonic acid
Cotton cropped leaves/petals	Thiacloprid	6-CNA, 4-OH-YRC 2894, 4-OH-KKO 2254, 6-CPA, 6-CPA glucoside, 6-CPA glucosylpentoside, 6-CPA glucosylphosphate/sulfate, thiacloprid sulfonic acid

NATURE OF THE RESIDUE IN RICE	Reference: 1043779, 1044380
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**
Test site	Rice grown in containers under green house conditions
Treatment	Prior to the rice transplanting, soil was treated at 1 mg a.i./plant hole or 5 mg a.i./plant hole.
Preharvest interval	62 days (forage), 142 days (straw grain)

For the low rate treatment, TRR were 0.28 ppm (forage), 1.00 ppm (straw) and 0.03 ppm (grain). For the high rate treatment, TRR was 0.20 ppm in grain. Forage and straw were not analysed. As the proposed use of thiacloprid is for foliar application, the rice metabolism study is being considered as supplemental information. The rice metabolism study was conducted by applying thiacloprid on the soil prior to planting. The predominant residue in the edible portion is the soil metabolite thiacloprid-amide.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Rice—forage	Thiacloprid-amide	Thiacloprid, 4-OH thiacloprid
Rice—straw	None	Thiacloprid, thiacloprid-amide, 4-OH thiacloprid-amide, 6-CPA, thiacloprid sulfonic acid, imine
Rice—grain	Thiacloprid-amide	Thiacloprid

Table 5 Integrated Food Residue Chemistry Summary

NATURE OF THE RESIDUE IN APPLE		Reference: 1043780
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied uniformly to 50 apples	
Rate	53 µg a.i./apple/application, 2 applications with 14-day interval	
End-use product	Soluble concentrate (600 SC)	
Preharvest interval	14 days	
Over 84% of the TRR in treated apples was removed by surface washing with dichloromethane, and an additional 13% of the TRR was released by extraction with methanol and water. Translocation study showed the majority of the residues remained in/on the leaves (77–84% TRR) with < 0.1% of the TRR detected in/on apples. Based on the metabolism study, the predominant residue in apple is thiacloprid.		
Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Apple	Thiacloprid (YRC 2894)	Thiacloprid-amide 4-hydroxy-thiacloprid
NATURE OF THE RESIDUE IN TOMATO		Reference: 1043781, 1043782
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied to tomatoes including the surrounding leaves, stems and plant stalk	
Rate	0.79 mg a.i./plant/application, 2 applications with 14-day interval	
End-use product	Soluble concentrate (600 SC)	
Preharvest interval	14 days	
Approximately 84–96% of the TRR in tomatoes was removed by washing with methanol. An additional 4–14% of the TRR was released by extraction the washed tomatoes with methanol. There was no translocation of radioactivity into the tomato fruit by uptake from the soil through the roots. Based on the metabolism study, the predominant residue in tomato is thiacloprid.		
Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Tomato	Thiacloprid (YRC 2894)	4-hydroxy-thiacloprid, 6-chloronicotinic acid (6-CNA), 6-chloropicolylalcohol glucoside, complex 6-chloropicolyl alcohol (6-CPA) glucoside
NATURE OF THE RESIDUE IN COTTON		Reference: 1043783
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**	
Test site	Greenhouse	
Treatment	Applied uniformly to cotton plants	

Rate	3 mg a.i./plant/application (simulating 125 g a.i./ha), 3 applications with 7-day interval
End-use product	Soluble concentrate (480 SC)
Preharvest interval	120 days. Leaves and petals cropped to the ground were collected throughout the study

Total radioactive residues were 1.12 ppm (undelinted seed), 3.21 ppm (gin byproducts), 30.35 ppm (dropped leaves/petals) and 0.06 ppm (lint). In cotton seed, the major residue identified was 6-CNA (45.8% of the TRR), thiacloprid was identified as a minor metabolite (0.6% of the TRR). The applicant proposed that the high levels of 6-CNA in cotton seed is a secondary metabolite taken from the leaves.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Cotton seed	6-CNA, 6-CNA conjugates, 6-CNA based compounds	Thiacloprid, 6-CPA conjugates
Cotton gin byproducts	Thiacloprid	6-CNA, 4-OH-YRC 2894, 4-OH-KKO 2254, 6-CPA, 6-CPA glucoside, 6-CPA glucosylpentoside, 6-CPA glucosylphosphate/sulfate, thiacloprid sulfonic acid
Cotton cropped leaves/petals	Thiacloprid	6-CNA, 4-OH-YRC 2894, 4-OH-KKO 2254, 6-CPA, 6-CPA glucoside, 6-CPA glucosylpentoside, 6-CPA glucosylphosphate/sulfate, thiacloprid sulfonic acid

NATURE OF THE RESIDUE IN RICE	Reference: 1043779, 1044380
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**
Test site	Rice grown in containers under green house conditions
Treatment	Prior to the rice transplanting, soil was treated at 1 mg a.i./plant hole or 5 mg a.i./plant hole.
Preharvest interval	62 days (forage), 142 days (straw grain)

For the low rate treatment, TRR were 0.28 ppm (forage), 1.00 ppm (straw) and 0.03 ppm (grain). For the high rate treatment, TRR was 0.20 ppm in grain. Forage and straw were not analysed. As the proposed use of thiacloprid is for foliar application, the rice metabolism study is being considered as supplemental information. The rice metabolism study was conducted by applying thiacloprid on the soil prior to planting. The predominant residue in the edible portion is the soil metabolite thiacloprid-amide.

Metabolites Identified	**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Rice—forage	Thiacloprid-amide	Thiacloprid, 4-OH thiacloprid
Rice—straw	None	Thiacloprid, thiacloprid-amide, 4-OH thiacloprid-amide, 6-CPA, thiacloprid sulfonic acid, imine
Rice—grain	Thiacloprid-amide	Thiacloprid

NATURE OF THE RESIDUE IN PLANT CELL CULTURES (apple, soybean, wheat, rose, cotton, citrus, tomato and potato)	Reference: 1043784
Radiolabel Position	**[Pyridinyl-^{14}C-Methyl]**
Test site	Plant cell suspension cultures
Treatment	Applied to cell suspension cultures and incubated at 25°C for 7 days
Rate	505 µg/40 mL cell suspension
Preharvest interval	7 days

After 7-day incubation, over 73% of the radioactivity was detected in the media with 1.7–27% of the radioactivity detected in cells. Thiacloprid accounted for 5–18% of the applied radioactivity in the plant cell extracts. Approximately 64-98% of the applied radioactivity was thiacloprid in the nutrient medium.

Metabolites Identified	Major Metabolites (> 10% TRR)	Minor Metabolites (< 10% TRR)
plant cell extract and nutrient medium	thiacloprid	up to 11 minor metabolites were detected but not identified.

Overview of Plant Metabolism

Thiacloprid was labelled only at the methylene bridge in all of the studies. Thiacloprid is metabolized is either by hydroxylation of the thiazolidinylidene ring in the 4-position or by hydrolysis of the cyano group to the amide. Thiacloprid may also be cleaved at the methylene bridge followed by conjugation or oxidation to the carboxylic acid to yield partially and fully oxidized products of 6-CPA and 6-chloronicotinic acid (6-CNA). The hydroxylated metabolites, 6-CPA or 6-CNA, may then be conjugated with sugars, phosphate/sulfate and endogenous plant components. In the case of rice, thiacloprid degrades in the soil to thiacloprid sulfonic acid and thiacloprid-amide. Thiacloprid sulfonic acid is further metabolized to 6-chloropicolyl alcohol (6-CPA). The soil metabolite thiacloprid-amide is degraded to the imine or 4-OH-thiacloprid-amide.

Therefore, the residue definition in plant, based on the predominant residues and toxicological significance, is the combined residues of thiacloprid and metabolites retaining the thiazolidine ring intact.

NATURE OF THE RESIDUE IN HEN	Reference: 1043772

Six laying hens were dosed daily at 10 mg/kg bw (corresponds to 124–166 ppm in feed) for 3 consecutive days. Hens were sacrificed 6 hours after the final dose was administered. Approximately 75% of the administered dose was eliminated with the excreta, only 0.06% and 0.71% of the total dose were determined in the eggs and tissues, respectively. Approximately 24% of the administered dose was assumed not have been excreted due to the short survival time following the last dose.

Radiolabel Position		[Pyridinyl-^{14}C-Methyl]	
Metabolites Identified		**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Poultry	Liver	Thiacloprid	KNO 2673, WAK 3583, KNO 1893, KNO 1872, KNO 1859 (NTN 35078), NKO 2672, WAK 6856, KNO 2684
	Fat, subcutaneous	Thiacloprid	KNO 2673
	Muscle	Thiacloprid	KNO 2673, WAK 3583, KNO 1893, WAK 6856, 6-CNA, KNO 1891, KNO 1889
	Egg	Thiacloprid	WAK 3583, 6-CNA, KNO 1893, WAK 6856

NATURE OF THE RESIDUE IN RUMINANT	Reference: 1043776
One lactating goat was dosed daily at 10 mg/kg bw (corresponds to 500 ppm in feed) for 3 consecutive days. Goat was sacrificed 6 hours after the final dose was administered. 53% of the administered dose was excreted (48.2% in urine, 4.5% in feces), 5.6% of the administered dose remaining in edible tissues/ organs and 0.93% of the administered dose in milk. Approximately 40.4% of the administered dose was assumed not have been excreted due to the short survival time following the last dose.	

Radiolabel Position		**[Pyridinyl-^{14}C-Methyl]**	
Metabolites Identified		**Major Metabolites (> 10% TRR)**	**Minor Metabolites (< 10% TRR)**
Goat	Kidney	Thiacloprid, KNO 2672, KNO 2621	KNO 2673, KNO 1891, WAK 3583, KNO 1893, ANC 1508 A/B, KNO 1859, KNO 2665, WAK 6856, KNO 2684
	Liver	Thiacloprid	KNO 2672, WAK 6856, KNO 2684
	Muscle	Thiacloprid	KNO 1893, KNO 2684
	Fat	Thiacloprid	KNO 1893, WAK 6856, KNO 2684
	Milk	Thiacloprid	KNO 1891, WAK 3583, ANC 1508 A/B, KNO 2672, KNO 1859, KNO 1864,, ANC 1502

Overview of Animal Metabolism

Thiacloprid was radiolabelled at the methylene bridge in all of the studies. In livestock, thiacloprid is metabolized primarily by hydroxylation of the thiazolidine-ring followed by conjugation with glucuronic acid to various metabolites. Also, cleavage of the thiazolidine ring occurs, with subsequent biotransformations. All of the metabolites identified contain the chloropyridine ring attached to the methylene bridge coupled to some fragmented portion of the thiazolidinylidene ring.

Therefore, the residue definition in animals, based on the predominant residues and toxicological significance, is the combined residues of thiacloprid and metabolites retaining the thiazolidine ring intact.

Crop Field Trials—Apple and Pear	Reference: 1044188, 1044189, 1044190, 1044191, 1078241

Apple (proposed rate: max. 576 g a.i./ha/season, 30-day PHI)

Trial site information: zone 1 (3 trial), 1A (1 trail), 2 (1 trial), 5 (2 trial), 5A (1 trial), 9 (1 trial), 10 (1 trial), 11 (4 trials) for a total of 14 trials in Canada and the United States.

Commodity	**Rate g a.i./ha**	**PHI (days)**	**Residue Levels (ppm)**				
			n	**Min.**	**Max.**	**HAFT**	**Median**
Apple	560	30	32	0.01	0.271	0.171	0.052

Pear (proposed rate: max. 576 g a.i./ha/season, 30-day PHI)

Trial site information: zone 1 (1 trial), 1A (1 trail), 5 (1 trial), 10 (2 trial), 11 (3 trials) for a total of 8 trials in Canada and the United States.

Commodity	**Rate g a.i./ha**	**PHI (days)**	**Residue Levels (ppm)**				
			n	**Min.**	**Max.**	**HAFT**	**Median**
Pear	560	30	20	0.041	0.268	0.242	0.114

Residue Decline

In the United States, trials apple and pear samples were collected at a 30- and 45-day PHI.

Commodity	Rate g a.i./ha	PHI (days)	Residue Levels (ppm)				
			n	Min.	Max.	HAFT	Median
Apple	560	30	28	< 0.01	0.271	0.171	0.061
		45	30	< 0.01	0.085	0.082	0.022
Pear	560	30	16	0.041	0.268	0.242	0.137
		45	16	0.023	0.258	0.173	0.125

Processing Studies | Reference: 1044096, 1044097, 1241185, 1241232

Fraction	Mean Residue Levels (ppm)	Calculated Concentration Factor
United States (experimental processing)		
Apple	0.239	N/A
Apple wet pomace	0.432	1.8
Crude apple juice	0.207	0.87
Italy and Germany (commercial processing)		
Apple	0.07, 0.10	N/A
Washed apple	0.063, 0.074	0.82
Apple juice	0.017, 0.021	0.23
Canned apple sauce	0.056, 0.055	0.68
Dried apple slices	0.054, 0.25	0.51
Dried apple pomace	0.607, 0.422	6.5

Storage Stability | Reference: 1044187

Thiacloprid residues are stable in apple, tomato and melon matrices for 540 days. The animal tissues and milk in the feeding study were analysed within 28 days of sacrifice; therefore, no animal storage stability study is required.

Livestock Feeding | Reference: 1043773, 1043774, 1043775, 1043777, 1043778

A refined anticipated dietary burden is calculated to be 0.072 ppm (beef) and 0.036 ppm (dairy), based on the apple median residue (0.0645 ppm) in Canadian trials, the 1.8-fold concentration factor for apple wet pomace and 62% crop treated in Canada.

Tissues/Matrices	Feeding Level (mg/kg feed/day)	Residue Levels (ppm)	
		Thiacloprid	Anticipated Residue
Muscle	2 ppm	0.018	0.00059
	6 ppm	0.055	
	20 ppm	0.157	
Liver	2 ppm	0.096	0.00335
	6 ppm	0.286	
	20 ppm	0.94	
Kidney	2 ppm	0.032	0.00189
	6 ppm	0.096	
	20 ppm	0.265	
Fat	2 ppm	0.014	0.0005
	6 ppm	0.032	
	20 ppm	0.113	
Milk*	2 ppm	0.017	0.00032
	6 ppm	0.044	
	20 ppm	0.126	

* The mean of residues in milk collected after plateau at day 5.

Table 6 Food Residue Chemistry Overview of Metabolism Studies and Risk Assessment

PLANT STUDIES	
RESIDUE DEFINITION FOR ENFORCEMENT/RISK ASSESSMENT	The combined residues of thiacloprid and metabolites retaining the thiazolidine ring intact.
METABOLIC PROFILE IN DIVERSE CROPS	Similar in apple, tomato and cotton. Different metabolites were identified in rice. It appears that thiacloprid was mainly metabolized in the soil and the metabolites were then translocated into rice plant.
ANIMAL STUDIES	
ANIMALS	**Ruminant, Hen**
RESIDUE DEFINITION FOR ENFORCEMENT/RISK ASSESSMENT	The combined residues of thiacloprid and metabolites retaining the thiazolidine ring intact.

METABOLIC PROFILE IN ANIMALS (goat, hen)		Similar	
FAT SOLUBLE RESIDUE		Yes	
DIETARY RISK FROM FOOD AND WATER			
Refined chronic non-cancer dietary risk ADI = 0.004 mg/kg bw Estimated chronic drinking water concentration = 1.55 µg/L (based on total rate of 0.42 kg a.i./ha/year)	**POPULATION**	**ESTIMATED RISK % of ACCEPTABLE DAILY INTAKE (ADI)**	
		Food Only	**Food and Water**
	All infants < 1 year	**3.5**	**6.2**
	Children 1–2 years	**3.3**	**4.5**
	Children 3–5 years	**2.3**	**3.4**
	Children 6–12 years	**1**	**1.8**
	Youth 13–19 years	**0.3**	**0.9**
	Adults 20–49 years	**0.3**	**1**
	Adults 50+ years	**0.4**	**1.2**
	Total population	**0.6**	**1.4**
Refined acute dietary exposure analysis, 95th percentile Estimated acute drinking water concentration = 1.55 ug/L (based on total rate of 0.42 kg/a.i./ha/year) ARfD = 0.01 mg/kg bw	**POPULATION**	**ESTIMATED RISK % of ACUTE REFERENCE DOSE (ARfD)**	
		Food Only	**Food and Water**
	All infants < 1 year	**44.8**	**46.4**
	Children 1–2 years	**39.1**	**39.5**
	Children 3 to 5 years	**31.2**	**31.4**
	Children 6–12 years	**16**	**16.4**
	Youth 13–19 years	**6.5**	**6.8**
	Adults 20–49 years	**5.8**	**6.1**
	Adults 50+ years	**6.5**	**6.9**
	Total population	**10.3**	**10.6**
Cancer Risk Assessment Q_1^* = 0.0379 mg/kg EEC =1.55 ug/L Full Refinements	**POPULATION**	**ESTIMATED RISK % of Q_1^***	
		Food Only	**Food and Water**
	Total population	**0.91×10^{-6}**	**2.15×10^{-6}**

Table 7 Fate and Behaviour in the Environment

Study Type	Test Substance	Study Conditions	Value	Major Transformation Products	Reference (PMRA #)
Soil					
Phototransformation	Thiacloprid	25°C, continuous irradiation Sandy loam (pH 7.1, %OM 1.9)	$t_{1/2}$ dark: 6 d $t_{1/2}$ irradiated: 20 d ⇒ dissipation most likely not due to phototransformation	KKO (24%; d 19)*	1043920
Aerobic metabolism	Thiacloprid (Data also allowed for the calculation of $t_{1/2}$ and $t_{9/10}$ values for the transformation product YRC 2894—amide)	20°C			1043925, 1043923
		Sandy loam (pH 6.7, OM 1.9)	DT_{50} thiacloprid: 5 d DT_{90} thiacloprid: 25 d $t_{1/2}$ YRC2894—amide: 224 d $t_{9/10}$ YRC2894—amide: 743 d	YRC 2894—amide (66%; d 30); CO_2 (25%; d 365)	
		Sand (pH 5.9, %OM 1.0)	DT_{50} thiacloprid: 3 d DT_{90} thiacloprid: 10 d $t_{1/2}$ YRC2894—amide: 62 d $t_{9/10}$ YRC2894—amide: 208 d	YRC 2894—amide (60%; d 8); YRC 2894—sulfonic acid (20%; d 60); CO_2 (10%; d 100)	
		Loamy sand (pH 6.3, %OM 4.3)	DT_{50} thiacloprid: 3 d DT_{90} thiacloprid: 10 d $t_{1/2}$ YRC2894—amide: 108 d $t_{9/10}$ YRC2894—amide: 360 d	YRC 2894—amide (72%; d 8); CO_2 (15%; d 100)	
		Silt loam (pH 6.0, %OM 4.1)	DT_{50} thiacloprid: 1 d DT_{90} thiacloprid: 3 d $t_{1/2}$ YRC2894—amide: 46 d $t_{9/10}$ YRC2894—amide: 154 d	YRC 2894—amide (74%; d 3); CO_2 (34%; d 100)	
	YRC 2894—sulfonic acid	Sandy loam (pH 6.7, %OM 1.9)	$t_{1/2}$: 28 d	Unidentified compound C (18%; d 77); Volatilized $[^{14}C]$residues (49%; d 101)	1043924

METABOLIC PROFILE IN ANIMALS (goat, hen)	Similar		
FAT SOLUBLE RESIDUE	Yes		
DIETARY RISK FROM FOOD AND WATER			
	POPULATION	**ESTIMATED RISK % of ACCEPTABLE DAILY INTAKE (ADI)**	
		Food Only	**Food and Water**
Refined chronic non-cancer dietary risk **ADI = 0.004 mg/kg bw** **Estimated chronic drinking water concentration = 1.55 µg/L (based on total rate of 0.42 kg a.i./ha/year)**	**All infants < 1 year**	3.5	6.2
	Children 1–2 years	3.3	4.5
	Children 3–5 years	2.3	3.4
	Children 6–12 years	1	1.8
	Youth 13–19 years	0.3	0.9
	Adults 20–49 years	0.3	1
	Adults 50+ years	0.4	1.2
	Total population	0.6	1.4
Refined acute dietary exposure analysis, 95th percentile **Estimated acute drinking water concentration = 1.55 ug/L (based on total rate of 0.42 kg/a.i./ha/year)** **ARfD = 0.01 mg/kg bw**	**POPULATION**	**ESTIMATED RISK % of ACUTE REFERENCE DOSE (ARfD)**	
		Food Only	**Food and Water**
	All infants < 1 year	44.8	46.4
	Children 1–2 years	39.1	39.5
	Children 3 to 5 years	31.2	31.4
	Children 6–12 years	16	16.4
	Youth 13–19 years	6.5	6.8
	Adults 20–49 years	5.8	6.1
	Adults 50+ years	6.5	6.9
	Total population	10.3	10.6
Cancer Risk Assessment **Q_1^* = 0.0379 mg/kg** **EEC =1.55 ug/L** **Full Refinements**	**POPULATION**	**ESTIMATED RISK % of Q_1^***	
		Food Only	**Food and Water**
	Total population	0.91×10^{-6}	2.15×10^{-6}

Table 7 Fate and Behaviour in the Environment

Study Type	Test Substance	Study Conditions	Value	Major Transformation Products	Reference (PMRA #)
Soil					
Phototransformation	Thiacloprid	25°C, continuous irradiation Sandy loam (pH 7.1, %OM 1.9)	$t_{1/2}$ dark: 6 d $t_{1/2}$ irradiated: 20 d → dissipation most likely not due to phototransformation	KKO (24%; d 19)*	1043920
Aerobic metabolism	Thiacloprid (Data also allowed for the calculation of $t_{1/2}$ and $t_{9/10}$ values for the transformation product YRC 2894—amide)	20°C Sandy loam (pH 6.7, OM 1.9)	DT_{50} thiacloprid: 5 d DT_{90} thiacloprid: 25 d $t_{1/2}$ YRC2894—amide: 224 d $t_{9/10}$ YRC2894—amide: 743 d	YRC 2894—amide (66%; d 30); CO_2 (25%; d 365)	1043925, 1043923
		Sand (pH 5.9, %OM 1.0)	DT_{50} thiacloprid: 3 d DT_{90} thiacloprid: 10 d $t_{1/2}$ YRC2894—amide: 62 d $t_{9/10}$ YRC2894—amide: 208 d	YRC 2894—amide (60%; d 8); YRC 2894—sulfonic acid (20%; d 60); CO_2 (10%; d 100)	
		Loamy sand (pH 6.3, %OM 4.3)	DT_{50} thiacloprid: 3 d DT_{90} thiacloprid: 10 d $t_{1/2}$ YRC2894—amide: 108 d $t_{9/10}$ YRC2894—amide: 360 d	YRC 2894—amide (72%; d 8); CO_2 (15%; d 100)	
		Silt loam (pH 6.0, %OM 4.1)	DT_{50} thiacloprid: 1 d DT_{90} thiacloprid: 3 d $t_{1/2}$ YRC2894—amide: 46 d $t_{9/10}$ YRC2894—amide: 154 d	YRC 2894—amide (74%; d 3); CO_2 (34%; d 100)	
	YRC 2894—sulfonic acid	Sandy loam (pH 6.7, %OM 1.9)	$t_{1/2}$: 28 d	Unidentified compound C (18%; d 77); Volatilized $[^{14}C]$residues (49%; d 101)	1043924

Study Type	Test Substance	Study Conditions	Value	Major Transformation Products	Reference (PMRA #)
		Sand (pH 5.9, %OM 1.2)	$t_{1/2}$: 77 d	Unidentified compound A (21%; d 101); Volatilized [^{14}C]residues (19%; d 101)	
		Loamy sand (pH 6.3, %OM 4.3)	$t_{1/2}$: 23 d	Unidentified compound A (14%; d 30); Volatilized [^{14}C]residues (86%; d 101)	
Adsorption/ desorption	Thiacloprid	Sandy loam (Borstel) (pH 6.3, %OM 2.0)	K_F[§] : 4.13, 1/n[†]: 0.830 K_{oc}: 359	N/A	1043930
		Sandy loam (Howe) (pH 7.1, %OM 1.3)	K_F: 5.58, 1/n: 0.837 K_{oc}: 744	N/A	
		Silty clay (pH 5.6, %OM 1.8)	K_D[§]: 6.63 K_{oc}: 632	N/A	
		Sand (pH 5.1, %OM 0.34)	K_D: 1.38 K_{oc}: 689	N/A	
		Sandy loam (Grape Vineyard) (pH 6.7, %OM 0.78)	K_F: 4.14, 1/n: 0.886 K_{oc}: 920	N/A	
		Loam (pH 7.7, %OM 1.7)	K_F: 6.44, 1/n: 0.862 K_{oc}: 651	N/A	
	YRC 2894—amide	Loamy sand (pH 5.9, %OM 1.2)	K_D: 2.37 K_{oc}: 344	N/A	1043931
		Sandy loam (Howe) (pH 6.7, %OM 1.9)	K_F: 3.44, 1/n: 0.816 K_{oc}: 307	N/A	
		Silty clay (pH 5.6, %OM 2.1)	K_D: 4.59 K_{oc}: 383	N/A	
		Sand (pH 5.1, %OM 0.34)	K_F: 0.340, 1/n: 0.770 K_{oc}: 170	N/A	
		Sandy loam (Grape Vineyard) (pH 6.7, %OM 0.78)	K_F: 2.01, 1/n: 0.815 K_{oc}: 446	N/A	
	YRC 2894—sulfonic acid	Loamy sand (pH 5.9, %OM 1.2)	K_D: 0.111 K_{oc}: 16	N/A	1043929
		Sandy loam (Howe) (pH 6.7, %OM 1.9)	K_F: 0.260 K_{oc}: 23	N/A	
		Silty clay loam (pH 6.1, %OM 2.6)	K_D: 0.262 K_{oc}: 18	N/A	
		Sand (pH 7.0, %OM 0.55)	K_F: 0.038, 1/n: 0.892 K_{oc}: 12	N/A	

Study Type	Test Substance	Study Conditions	Value	Major Transformation Products	Reference (PMRA #)
		Sandy loam (Grape Vineyard) (pH 6.7, %OM 0.78)	K_F: 0.121 K_{oc}: 27	N/A	
Soil leaching	Thiacloprid	2-day aged soil	No residues of thiacloprid detected below 12 cm or in leachates. YRC 2894—amide: No residues detected below 24 cm or in leachates.	YRC 2894—amide	1043932
		30-day and 60-day aged soil	No residues of thiacloprid detected beyond the top aged soil or in leachates. YRC 2894—amide: No residues detected below 24 cm or in leachates. YRC 2894—sulfonic acid: No residues measured in any of the column segments. Residues detected at 11.6 and 18.5% in leachates for the 30-day and 60-day aged soil tests, respectively.	YRC 2894—amide and YRC 2894— sulfonic acid	1043933
Field dissipation	YRC 2894 480 SC at 192.5 g a.i./ha; 2 applications 15-d interval	Studies conducted in the United States (Wisconsin, Georgia and California); bare plots, grass was planted after application	DT_{50}: 1.9–23 d DT_{90} : 6.3–77 d	YRC 2894—amide DT_{50}: 50–267 d DT_{90} : 166–886 d	1044119, 1044120, 1044123
	YRC 2894 480 SC at 288 g a.i./ha; single application	Studies conducted in Europe (France, Spain, Germany, Great Britain) either bare plots or grass plots	DT_{50}: 7–30 d DT_{90}: 23–100 d	YRC 2894—amide DT_{50} and DT_{90} not calculated YRC 2894—sulfonic acid DT_{50} and DT_{90} not calculated	1044121

Study Type	Test Substance	Study Conditions	Value	Major Transformation Products	Reference (PMRA #)
Field leaching	YRC 2894 480 SC	All field studies	Thiacloprid: No residues detected below 30 cm at any time. YRC 2894—amide: No residues detected below 20 cm at any time. YRC 2894—sulfonic acid: No residues detected below 10 cm at any time.		1044119, 1044120, 1044121, 1044122, 1044123
Aquatic systems					
Hydrolysis	Thiacloprid	25°C (pH 5, pH 7 and pH 9)	Stable at all three pH	None	1043919
Phototransformation	Thiacloprid	24°C, continuous irradiation, sterile water (pH 7)	$t_{1/2}$ dark: stable $t_{1/2}$ irradiated: 83 d Predicted environmental half-life: 381 d	None	1043921
Aerobic metabolism	Thiacloprid	20°C Pond water pH 7.6 Sediment (sandy loamy silt) %OM 6.62 Lake water pH 8.3 Sediment (sand) %OM 0.67	 Whole system $t_{1/2}$: 26 d $t_{9/10}$: 67 d Whole system $t_{1/2}$: 11 d $t_{9/10}$: 40 d	 YRC 2894—amide (50%; whole system; d 35) YRC 2894—amide (69%; whole system; d 35)	1043927
Anaerobic metabolism	Thiacloprid	20°C Pond water pH 9.1 Sediment not characterized	Whole system $t_{1/2}$: > 360 d $t_{9/10}$: > 360 d	YRC 2894—amide (14%; whole system; d 360)	1043928

* Numbers in parentheses represent maximum concentrations [as % of applied] and time [days] to maximum concentration.

§ K_F: Freundlich adsorption coefficient; K_D: soil-water partition coefficient. Either one of these coefficients is chosen depending on the r^2 value of plotted raw data (concentration in soil *vs* solution).

† 1/n: exponent for the Freundlich isotherm

Figure 1 Transformation Pathway for Thiacloprid in the Environment

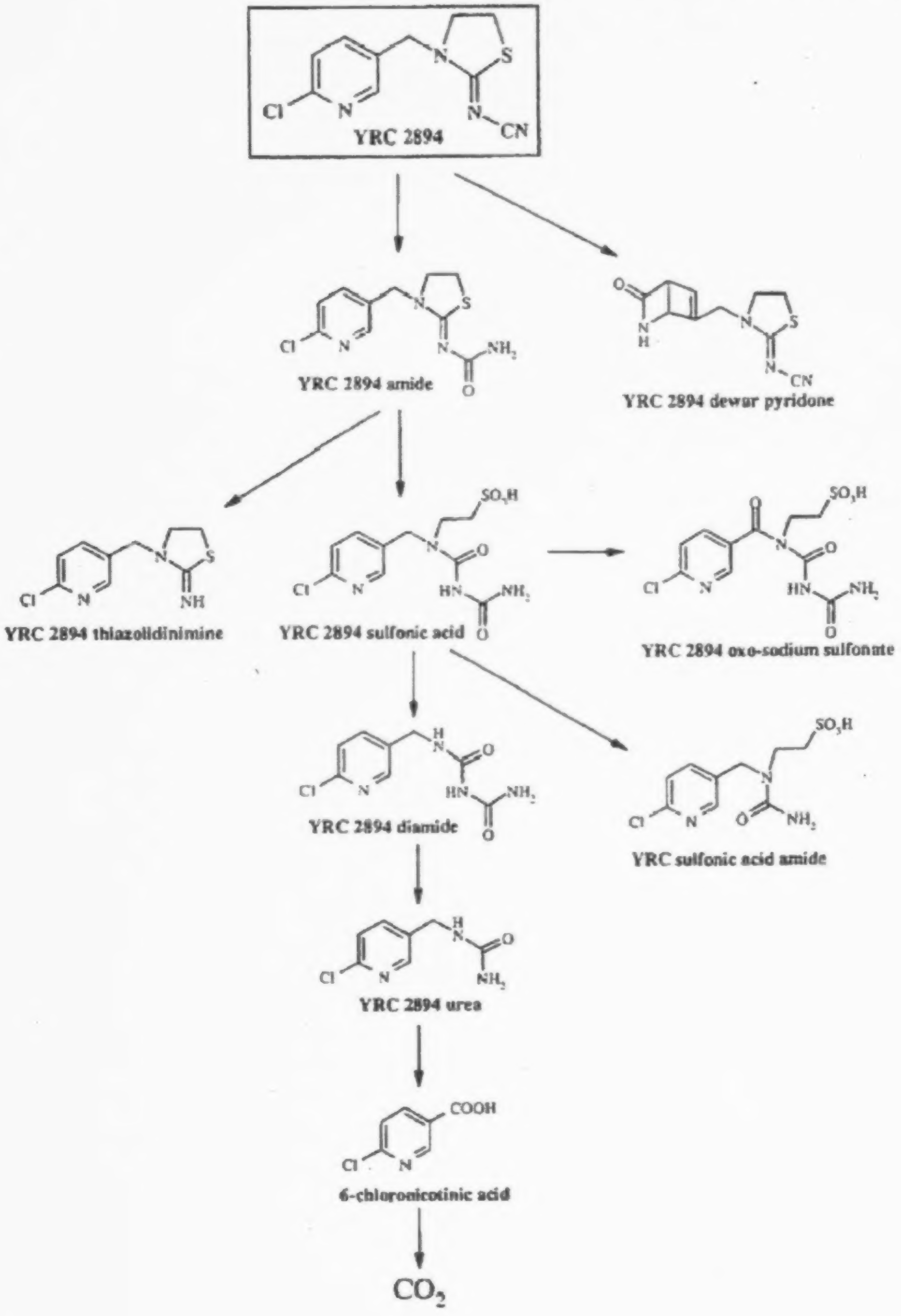
YRC 2894
YRC 2894 amide
YRC 2894 dewar pyridone
YRC 2894 thiazolidinimine
YRC 2894 sulfonic acid
YRC 2894 oxo-sodium sulfonate
YRC 2894 diamide
YRC sulfonic acid amide
YRC 2894 urea
6-chloronicotinic acid
CO2

Table 8 Toxicity to Non-Target Species

Organism	Species	Study Type	Test Substance	Toxicity Data	Reference (PMRA #)
Terrestrial Organisms					
Mammals	Rat	Acute oral	Thiacloprid	LD_{50} (♀): 444 mg a.i./kg bw NOEL: 100 mg a.i./kg bw (mortality)	1043814
			YRC 2894—amide	LD_{50}: > 2000 mg/kg bw **NOEL: > 2000 mg/kg bw (mortality)**	1043813
			YRC 2894—sulfonic acid	LD_{50}: > 2000 mg/kg bw **NOEL: > 2000 mg/kg bw (mortality)**	1043815
			YRC 2894 SC 480	LD_{50}: 122–203 mg a.i./kg bw NOEL: 81 mg a.i./kg bw (mortality)	1044148
	Mouse	Acute oral	Thiacloprid	LD_{50} (♀): 147 mg a.i./kg bw **NOEL: 70 mg a.i./kg bw (mortality)**	1043817
Birds	Bobwhite quail	Acute oral	Thiacloprid	NOEL: 2000 mg a.i./kg bw (mortality; highest concentration tested) **NOEL: 152 mg a.i./kg bw (clinical signs)**	1044067
		Short-term dietary	Thiacloprid	NOEC: 2550 mg a.i./kg diet (mortality) NOEC: 1338 mg a.i./kg diet (clinical signs)	1044068
		Reproduction	Thiacloprid	NOEC: 466 mg a.i./kg diet (reproductive effects; highest concentration tested)	1044071
	Mallard duck	Short-term dietary	Thiacloprid	NOEC: 5100 mg a.i./kg diet (mortality; highest concentration tested) **NOEC: 313 mg a.i./kg diet (body weight)**	1044069
		Reproduction	Thiacloprid	NOEC: 140 mg a.i./kg diet (reproductive effects) **NOEC: 48 mg a.i./kg diet (adult body weight)**	1044072
Bee	*Apis mellifera*	Acute oral	Thiacloprid	LD_{50}: 19.4 (14.7–24.1) kg a.i./ha	1044041
			YRC 2894 SC 480	**LD_{50}: 5.92 (5.60–7.82) kg a.i./ha**	1044040

Organism	Species	Study Type	Test Substance	Toxicity Data	Reference (PMRA #)
		Acute contact	Thiacloprid	LD_{50}: 42.3 (34.0–52.2) kg a.i./ha	1044041
			YRC 2894 SC 480	**LD_{50}: 22.6 (18.9–31.2) kg a.i./ha**	1044040
Other arthropods	Green lacewing (*Chrysopa carnea*)	Chronic contact	YRC 2894 SC 480	LR_{50}: 58.1 (29.8–177) g a.i./ha **NOER: < 0.91 g a.i./ha (reproduction)**	1241509
Earthworm	*Eisenia fetida*	Acute	Thiacloprid	LC_{50}: 102 (87–118) mg a.i./kg soil dw **NOEC: 0.97 mg a.i./kg soil dw (body weight)**	1044036
			YRC 2894 SC 480	LC_{50}: 51 (46–56) mg a.i./kg soil dw NOEC: 1.0 mg a.i./kg soil dw (body weight)	1044037
Vascular plants	Monocots (corn, onion, ryegrass, wheat) and dicots (canola, carrot, green bean, lettuce, soybean, tomato)	Seedling emergence	YRC 2894 SC 480	EC_{25}: > 560 g a.i./ha **NOEC: 560 g a.i./ha** (all endpoints; highest concentration tested)	1043962
		Vegetative vigour	YRC 2894 SC 480	EC_{25}: > 560 g a.i./ha **NOEC: 560 g a.i./ha** (all endpoints; highest concentration tested)	1043963
Freshwater Organisms					
Invertebrates	*Daphnia magna*	Acute	Thiacloprid	EC_{50}: > 85.1 mg a.i./L NOEC: 9.10 mg a.i./L (immobilization)	1044044
			YRC 2894—sulfonic acid	**EC_{50}: > 96.1 mg/L** NOEC: 96.1 mg /L (all endpoints; highest concentration tested)	1044043
		Chronic	Thiacloprid	NOEC: 1.05 mg a.i./L (adult body length)	1044045
	Chironomus riparius	Chronic	YRC 2894 SC 480	**NOEC: 0.68 µg a.i./L (all endpoints)**	1044048
			YRC 2894—amide	**NOEC: 0.077 mg/L (all endpoints; highest concentration tested)**	1044047

Organism	Species	Study Type	Test Substance	Toxicity Data	Reference (PMRA #)
	Hyalella azteca	Acute	Thiacloprid	**LC_{50}: 40.7 (31.0–56.5) µg a.i./L** NOEC: 11.3 µg a.i./L (immobilization)	1043967
			YRC 2894—amide	**LC_{50}: > 47.6 mg/L** NOEC: 5.55 mg/L (sublethal effects)	1043968
Fish	Rainbow trout	Acute	Thiacloprid	LC_{50}: 30.2 (22.6–38.5) mg a.i./L NOEC: < 4.99 mg a.i./L (sublethal effects)	1044055
			YRC 2894—sulfonic acid	**LC_{50}: > 95.1 mg/L** NOEC: 95.1 mg/L (sublethal effects; highest concentration tested)	1044056
			YRC 2894—amide	LC_{50}: > 79.4 mg/L NOEC: 79.4 mg/L (sublethal effects; highest concentration tested)	1044054
		Chronic (early life stages)	Thiacloprid	**NOEC: 0.918 mg a.i./L (growth)**	1044062
	Bluegill sunfish	Acute	Thiacloprid	**LC_{50}: 25.2 (16.7–48.7) mg a.i./L** NOEC: < 6.20 mg a.i./L (sublethal effects)	1044058
			YRC 2894—amide	**LC_{50}: > 78.6 mg/L** NOEC: < 78.6 mg/L (mortality; limit test)	1044057
			YRC 2894 SC 480	LC_{50}: 33.3 (14.7–59.5) mg a.i./L NOEC: 3.82 mg a.i./L (sublethal effects)	1044059
	Fathead minnow	Acute	Thiacloprid	LC_{50}: > 104 mg a.i./L NOEC: 13.1 mg a.i./L (mortality)	1044061
		Chronic (early life stages)	Thiacloprid	NOEC: > 0.170 mg a.i./L (all endpoints; highest concentration tested)	1044063
		Chronic (full life-cycle)	Thiacloprid	**NOEC: 0.78 mg a.i./L (growth–parental generation)**	1.04e+13

Organism	Species	Study Type	Test Substance	Toxicity Data	Reference (PMRA #)
Amphibians	Fish species used as surrogate	Acute (based on acute fish studies; most sensitive: bluegill sunfish)	Thiacloprid	**LC_{50}: 25.2 (16.7–48.7) mg a.i./L**	1044058
		Chronic (based on early life stage fish studies; most sensitive/accurate NOEC: rainbow trout)	Thiacloprid	**NOEC: 0.918 mg a.i./L (growth)**	1044062
Algae	Green alga	*S. capriconutum* 120-h	Thiacloprid	EC_{50}: 60.6 (58.4–62.6) mg a.i./L NOEC: 16.8 mg a.i./L (biomass)	1044074
		S. subspicatus 72-h	Thiacloprid	**EC_{50}: 45.9 (42.2–48.2) mg a.i./L** NOEC: 16.8 mg a.i./L (cell density)	1044076
		S. subspicatus 72-h	YRC 2894—sulfonic acid	**EC_{50}: > 97.6 mg/L** NOEC: > 97.6 mg/L (all endpoints; highest concentration tested)	1044075
Plant	*Lemna gibba*	Test substance dissolved in water; 15-d exposure	Thiacloprid	**EC_{50}: > 95.4 mg a.i./L** NOEC: 46.8 mg a.i./L (growth)	1043966
Estuarine/Marine Organisms					
Invertebrates	Mysid shrimp	Acute	Thiacloprid	LC_{50}: 31.3 (26.5–37.0) µg a.i./L NOEC: 9.7 µg a.i./L (sublethal effects)	1044049
			YRC 2894 SC 480	**LC_{50}: 20.7 (16.1–26.4) µg a.i./L** NOEC: 3.42 µg a.i./L (all endpoints)	1044050
		Chronic	Thiacloprid	**NOEC: 1.1 µg a.i./L** (reproduction and growth)	1044052
	Eastern oyster	Acute	Thiacloprid	EC_{50}: 4.0 (2.7–5.4) mg a.i./L NOEC: 1.7 mg a.i./L	1044051
Fish	Sheepshead minnow	Acute	Thiacloprid	**LC_{50}: 19.7 (15.5–30.7) mg a.i./L** NOEC: 3.5 mg a.i./L (sublethal effects)	1044060

Toxicity values in **bold** are the endpoints selected for risk assessment of each category/time-scale combination.

Table 9 Screening Level Risk Assessment on Non-Target Species

Organism	Study Type	Test Substance	Toxicity	Exposure[a]	Units	RQ[b]
Terrestrial Vertebrates—all food obtained from treated field without dissipation of active substance						
Mammals	Acute oral	Thiacloprid	NOEL: 70	22.9[c]	mg a.i./kg bw	0.327
		YRC 2894—amide	NOEL: > 2000	23.3[d]	mg/kg bw	< 0.012
		YRC 2894—sulfonic acid	NOEL: > 2000	30.9[d]	mg/kg bw	< 0.015
Birds	Acute oral	Thiacloprid	NOEL: 152	1.92	mg a.i./kg bw	0.023
	Short-term dietary	Thiacloprid	NOEC: 313	8.52	mg a.i./kg diet	0.027
	Reproduction	Thiacloprid	NOEC: 48	8.52	mg a.i./kg diet	0.178
Terrestrial Invertebrates—contact exposure to treated surfaces or ingestion of a treated sucrose solution (arthropods), or exposure to treated soil (earthworms)						
Bee	Acute oral	YRC 2894 SC 480	LD_{50}: 5.92	0.21	kg a.i./ha	0.035
	Acute contact	YRC 2894 SC 480	LD_{50}: 22.6	0.21	kg a.i./ha	0.009
Other arthropods	Chronic contact	YRC 2894 SC 480	NOER: < 0.91	210	g a.i./ha	> 231
Earthworm	Acute	Thiacloprid	NOEC: 0.97	0.161	mg a.i./kg soil	0.166
Terrestrial Vascular Plants—exposure to direct overspray						
Vascular plants	Seedling emergence and vegetative vigour	YRC 2894 SC 480	NOEC: 560	252	g a.i./ha	0.45
Freshwater Organisms—exposure to water body of 80-cm depth directly oversprayed (15-cm depth for amphibians)						
Invertebrates	Acute	Thiacloprid	1/2 LC_{50}: 0.0204	0.0444	mg a.i./L	2.18
		YRC 2894—sulfonic acid	1/2 LC_{50}: > 48.1	0.063	mg a.i./L	< 0.001
		YRC 2894—amide	1/2 LC_{50}: > 23.8	0.0476	mg a.i./L	< 0.002
	Chronic	YRC 2894 SC 480	NOEC: 0.00068	0.0444	mg a.i./L	65.3
		YRC 2894—amide	NOEC: 0.077	0.0476	mg a.i./L	0.745

Organism	Study Type	Test Substance	Toxicity	Exposure[a]	Units	RQ[b]
Fish	Acute	Thiacloprid	1/10 LC_{50}: 2.52	0.0444	mg a.i./L	0.018
		YRC 2894—sulfonic acid	1/10 LC_{50}: > 9.51	0.063	mg a.i./L	< 0.007
		YRC 2894—amide	1/10 LC_{50}: > 7.86	0.0476	mg a.i./L	< 0.006
	Chronic (early life stages)	Thiacloprid	NOEC: 0.918	0.0444	mg a.i./L	0.048
	Chronic (full life-cycle)	Thiacloprid	NOEC: 0.78	0.0444	mg a.i./L	0.057
Amphibians	Acute	Thiacloprid	1/10 LC_{50}: 2.52	0.237	mg a.i./L	0.094
	Chronic	Thiacloprid	NOEC: 0.918	0.237	mg a.i./L	0.312
Algae	Acute (72 h)	Thiacloprid	1/2 EC_{50}: 23.0	0.0444	mg a.i./L	0.002
		YRC 2894—sulfonic acid	1/2 EC_{50}: > 48.8	0.063	mg a.i./L	< 0.001
Plant	Dissolved; 15-d exposure	Thiacloprid	1/2 EC_{50}: > 47.7	0.0444	mg a.i./L	< 0.001
Estuarine/Marine Organisms—exposure to water body of 30-cm depth directly oversprayed						
Invertebrates	Acute	Thiacloprid	1/2 LC_{50}: 0.0104	0.0444	mg a.i./L	4.27
	Chronic	Thiacloprid	NOEC: 0.0011	0.0444	mg a.i./L	40.4
Fish	Acute	Thiacloprid	1/10 LC_{50}: 1.97	0.0444	mg a.i./L	0.023

[a] Exposure is estimated according to nomogram developed by the USEPA (1986) modified according to Fletcher et al. (1994).

[b] Risk quotient = exposure / toxicity, trigger for a refined assessment is > 50 for bees, > 2 for other arthropods and > 1 for all other organisms.

[c] Calculated using standardized values of 0.006 kg/day for mouse daily food intake rate and 0.033 kg for mouse body weight (USEPA 1988).

[d] Calculated using standardized values of 0.060 kg/day for rat daily food intake rate and 0.35 kg for rat body weight (USEPA 1988).

[e] Calculated using daily food intake rate of 0.0088 kg/day and body weight of 0.202 kg from bobwhite quail acute oral toxicity study.

Shading indicates that the screening level risk quotient exceeds the trigger for a refined assessment.

Table 9 Screening Level Risk Assessment on Non-Target Species

Organism	Study Type	Test Substance	Toxicity	Exposure[a]	Units	RQ[b]
Terrestrial Vertebrates—all food obtained from treated field without dissipation of active substance						
Mammals	Acute oral	Thiacloprid	NOEL: 70	22.9[c]	mg a.i./kg bw	0.327
		YRC 2894—amide	NOEL: > 2000	23.3[d]	mg/kg bw	< 0.012
		YRC 2894—sulfonic acid	NOEL: > 2000	30.9[d]	mg/kg bw	< 0.015
Birds	Acute oral	Thiacloprid	NOEL: 152	1.92	mg a.i./kg bw	0.023
	Short-term dietary	Thiacloprid	NOEC: 313	8.52	mg a.i./kg diet	0.027
	Reproduction	Thiacloprid	NOEC: 48	8.52	mg a.i./kg diet	0.178
Terrestrial Invertebrates—contact exposure to treated surfaces or ingestion of a treated sucrose solution (arthropods), or exposure to treated soil (earthworms)						
Bee	Acute oral	YRC 2894 SC 480	LD$_{50}$: 5.92	0.21	kg a.i./ha	0.035
	Acute contact	YRC 2894 SC 480	LD$_{50}$: 22.6	0.21	kg a.i./ha	0.009
Other arthropods	Chronic contact	YRC 2894 SC 480	NOER: < 0.91	210	g a.i./ha	> 231
Earthworm	Acute	Thiacloprid	NOEC: 0.97	0.161	mg a.i./kg soil	0.166
Terrestrial Vascular Plants—exposure to direct overspray						
Vascular plants	Seedling emergence and vegetative vigour	YRC 2894 SC 480	NOEC: 560	252	g a.i./ha	0.45
Freshwater Organisms—exposure to water body of 80-cm depth directly oversprayed (15-cm depth for amphibians)						
Invertebrates	Acute	Thiacloprid	1/2 LC$_{50}$: 0.0204	0.0444	mg a.i./L	2.18
		YRC 2894—sulfonic acid	1/2 LC$_{50}$: > 48.1	0.063	mg a.i./L	< 0.001
		YRC 2894—amide	1/2 LC$_{50}$: > 23.8	0.0476	mg a.i./L	< 0.002
	Chronic	YRC 2894 SC 480	NOEC: 0.00068	0.0444	mg a.i./L	65.3
		YRC 2894—amide	NOEC: 0.077	0.0476	mg a.i./L	0.745

Organism	Study Type	Test Substance	Toxicity	Exposure[a]	Units	RQ[b]
Fish	Acute	Thiacloprid	1/10 LC_{50}: 2.52	0.0444	mg a.i./L	0.018
		YRC 2894—sulfonic acid	1/10 LC_{50}: > 9.51	0.063	mg a.i./L	< 0.007
		YRC 2894—amide	1/10 LC_{50}: > 7.86	0.0476	mg a.i./L	< 0.006
	Chronic (early life stages)	Thiacloprid	NOEC: 0.918	0.0444	mg a.i./L	0.048
	Chronic (full life-cycle)	Thiacloprid	NOEC: 0.78	0.0444	mg a.i./L	0.057
Amphibians	Acute	Thiacloprid	1/10 LC_{50}: 2.52	0.237	mg a.i./L	0.094
	Chronic	Thiacloprid	NOEC: 0.918	0.237	mg a.i./L	0.312
Algae	Acute (72 h)	Thiacloprid	1/2 EC_{50}: 23.0	0.0444	mg a.i./L	0.002
		YRC 2894—sulfonic acid	1/2 EC_{50}: > 48.8	0.063	mg a.i./L	< 0.001
Plant	Dissolved; 15-d exposure	Thiacloprid	1/2 EC_{50}: > 47.7	0.0444	mg a.i./L	< 0.001
Estuarine/Marine Organisms—exposure to water body of 30-cm depth directly oversprayed						
Invertebrates	Acute	Thiacloprid	1/2 LC_{50}: 0.0104	0.0444	mg a.i./L	4.27
	Chronic	Thiacloprid	NOEC: 0.0011	0.0444	mg a.i./L	40.4
Fish	Acute	Thiacloprid	1/10 LC_{50}: 1.97	0.0444	mg a.i./L	0.023

[a] Exposure is estimated according to nomogram developed by the USEPA (1986) modified according to Fletcher et al. (1994).

[b] Risk quotient = exposure / toxicity, trigger for a refined assessment is > 50 for bees, > 2 for other arthropods and > 1 for all other organisms.

[c] Calculated using standardized values of 0.006 kg/day for mouse daily food intake rate and 0.033 kg for mouse body weight (USEPA 1988).

[d] Calculated using standardized values of 0.060 kg/day for rat daily food intake rate and 0.35 kg for rat body weight (USEPA 1988).

[e] Calculated using daily food intake rate of 0.0088 kg/day and body weight of 0.202 kg from bobwhite quail acute oral toxicity study.

Shading indicates that the screening level risk quotient exceeds the trigger for a refined assessment.

Table 10 Refined Risk Assessment on Non-Target Species

Category	Study Type	Test Substance	Toxicity	Refinement	Risk Characterization
Freshwater Organisms					
Invertebrates	Acute	Thiacloprid	1/2 LC_{50}: 0.0204 mg a.i./L	**Drift Assessment:** The screening level assumes 100% drift to a water body. The maximum drift deposition expected for airblast application at one metre downwind is 74% (early). The corresponding EEC is 0.033 mg a.i./L.	Risk quotient value is 1.62. Therefore, buffer zones larger than one metre are required to mitigate the risk to freshwater invertebrates. Buffer zones have been calculated and added on the label under the **Directions for Use**.
				Runoff Assessment: Determine the geographic areas where the major crop (apple) is grown. Pick the scenario that generates the highest EEC for freshwater exposure (apple orchard in Quebec), assuming no drift. The 90th percentile of the predicted concentration in water as a result of runoff 96 hours after pesticide application is 0.00261 mg a.i./L.	Risk quotient value is 0.128 and no mitigation is needed.
	Chronic	Thiacloprid	NOEC: 0.00068 mg a.i./L	**Drift Assessment:** The screening level assumes 100% drift to a water body. The maximum drift deposition expected for airblast application at one metre downwind is 74% (early). The corresponding EEC is 0.033 mg a.i./L.	Risk quotient value is 48.5. Therefore, buffer zones larger than one metre are required to mitigate the risk to freshwater invertebrates. Buffer zones have been calculated and added on the label under the **Directions for Use**.
				Runoff Assessment: Determine the geographic areas where the major crop (apple) is grown. Pick the scenario that generates the highest EEC for freshwater exposure (apple orchard in Quebec), assuming no drift. The 90th percentile of the predicted concentration in water as a result of runoff 21 days after pesticide application is 0.00171 mg a.i./L.	Risk quotient value is 2.51. No means to mitigate risk from run-off are currently available. Label statements providing instructions to minimize run-off as well as a label statement indicating the toxicity of this pesticide to aquatic organisms have been added to the product label.

Category	Study Type	Test Substance	Toxicity	Refinement	Risk Characterization
Marine Organisms					
Invertebrates	Acute	Thiacloprid	1/2 LC_{50}: 0.0104 mg a.i./L	**Drift Assessment:** The screening level assumes 100% drift to a water body. The maximum drift deposition expected for airblast application at one metre downwind is 74% (early). The corresponding EEC is 0.033 mg a.i./L.	Risk quotient value is 3.17. Therefore, buffer zones larger than one metre are required to mitigate the risk to estuarine/marine invertebrates. Buffer zones have been calculated and added on the label under the **Directions for Use**.
				Runoff Assessment: Determine the geographic areas where the major crop (apple) is grown. Pick the scenario that generates the highest EEC for marine exposure (apple orchard in Nova Scotia), assuming no drift. The 90th percentile of the predicted concentration in water as a result of runoff 96 hours after pesticide application is 0.00276 mg a.i./L.	Risk quotient value is 0.265 and no mitigation is needed.
	Chronic	Thiacloprid	NOEC: 0.0011 mg a.i./L	**Drift Assessment:** The screening level assumes 100% drift to a water body. The maximum drift deposition expected for airblast application at one metre downwind is 74% (early). The corresponding EEC is 0.033 mg a.i./L.	Risk quotient value is 30. Therefore, buffer zones larger than one metre are required to mitigate the risk to estuarine/marine invertebrates. Buffer zones have been calculated and added on the label under "Directions for use".
				Runoff Assessment: Determine the geographic areas where the major crop (apple) is grown. Pick the scenario that generates the highest EEC for marine exposure (apple orchard in Nova Scotia), assuming no drift. The 90th percentile of the predicted concentration in water as a result of runoff 21 days after pesticide application is 0.00195 mg a.i./L.	Risk quotient value is 1.77. No means to mitigate risk from run-off are currently available. Label statements providing instructions to minimize run-off as well as a label statement indicating the toxicity of this pesticide to aquatic organisms have been added to the product label.

Table 11 Alternative Insecticides for Pest Control in Apples

Technical Grade Active Ingredient	Insect Claims	Insecticide Classification Group	Comments
Carbaryl	apple maggot, codling moth, leafhoppers, plum curculio, spotted tentiform leafminer	0.0416666667	
Formetanate hydrochloride	Leafhoppers	0.0416666667	White apple leafhopper only
Methomyl	Codling moth, leafhoppers, spotted tentiform leafminer, mullein bug	0.0416666667	White apple leafhopper only
Oxamyl	Leafhoppers, spotted tentiform leafminer	0.0416666667	Non-bearing apple only
Pirimicarb	Leafhoppers	0.0416666667	White apple leafhopper only
Azinphos-methyl	Apple maggot, codling moth, plum curculio, mullein bug, leafhoppers	1B	
Diazinon	Apple maggot, codling moth, mullein bug, spotted tentiform leafminer	1B	
Malathion	Codling moth, plum curculio	1B	
Phosalone	Apple maggot, codling moth, leafhoppers, plum curculio	1B	
Phosmet	Apple maggot, codling moth, plum curculio, spotted tentiform leafminer	1B	
Endosulfan	Codling moth, leafhoppers	2	
Lambda-cyhalothrin	Codling moth, leafhoppers, plum curculio, spotted tentiform leafminer	3	White apple leafhopper only
Cypermethrin	Apple maggot, codling moth, leafhoppers, plum curculio, spotted tentiform leafminer, mullein bug	3	White apple leafhopper only
Deltamethrin	Codling moth, leafhoppers, spotted tentiform leafminer, mullein bug	3	White apple leafhopper only
Permethrin	Apple maggot, codling moth, leafhoppers, plum curculio, spotted tentiform leafminer, mullein bug	3	White apple leafhopper only
Acetamiprid	Codling moth, oriental fruit moth, leafhoppers, spotted tentiform leafminer	4	Oriental fruit moth in Ontario only
Imidacloprid	Leafhoppers, spotted tentiform leafminer, mullein bug	4	White apple leafhopper only
Abamectin	Spotted tentiform leafminer	6	

Technical Grade Active Ingredient	Insect Claims	Insecticide Classification Group	Comments
Methoxyfenozide	Codling moth, spotted tentiform leafminer, oriental fruit moth	18	
Tebufenozide	Codling moth, spotted tentiform leafminer	18	
Codling moth pheromone	Codling moth	Not classified	
Cydia pomonella Granulovirus	Codling moth	Not classified	
Oriental fruit moth pheromone	Oriental fruit moth	Not classified	
Kaolin clay	Apple maggot, codling moth (first generation only), Oriental fruit moth, plum curculio, leafhoppers	Not classified	

Table 12 **Label Claims Proposed by Applicant and Whether Acceptable or Unsupported**

Applicant-Proposed Label Claims	Accepted Label Claims	Unsupported Label Claims and Comments
Plum curculio on pome fruit	Plum curculio on pome fruit	All proposed label claims were supported
Codling moth on pome fruit	Codling moth on pome fruit	
Oriental fruit moth on pome fruit	Oriental fruit moth on pome fruit	
Apple maggot on pome fruit	Apple maggot on pome fruit	
Mullein bug on pome fruit	Mullein bug on pome fruit	
Spotted tentiform leafminer on pome fruit	Spotted tentiform leafminer on pome fruit	
Leafhoppers on pome fruit	Leafhoppers on pome fruit	

Appendix II Supplemental Maximum Residue Limit Information—International Situation and Trade Implications

The proposed Canadian MRL(s) are the same as those in the United States. Currently, there are no Codex MRLs for this active ingredient.

Appendix III Crop Groups: Numbers and Definitions

Crop Group Number	Name of the Crop Group	Commodity
11	Pome Fruit	Apple; crab apple; loquat; mayhaw; pear; pear, oriental; quince

References

1.0 Chemistry Evaluation Section

1.1 Technical Grade Active Ingredient

PMRA 1259244	Physical and Chemical Properties of YRC 2894, Bayer Report #s 107899, 107935, 108205, 108449 and 109039, Company Report # 2-1;BR 1988, April 23, 1999, 130 pages, DACO 2.14.1, 2.14.10, 2.14.11, 2.14.13, 2.14.14, 2.14.2, 2.14.3, 2.14.4, 2.14.5, 1.14.6, 2.14.7, 2.14.8, 2.14.9, 2.15 and 2.16.
PMRA 1259245	Product Chemistry of Thiacloprid Technical, Bayer Documents ANR-01799, ANR-01899, ANR-01999, ANR-05299, 109027 and 109025, Company Report # 2-2;BR 1987/MO-00-002595, July 29, 1999, 110 pages, DACO 0.9.1, 2.11.1, 2.11.2, 2.11.3, 2.11.4, 2.12.1, 2.13.1, 2.13.3, 2.13.4, 2.16, 2.3.1, 2.4, 2.5, 2.6, and 2.7.
PMRA 1288773	Statement of Product Specification Form dated 06/03/30, Bayer, DACO 2.12.2.
PMRA 1259246	Thiacloprid Technical Insecticide, Bayer CropSciences Inc., Report # 05005DC, March 21, 2005, 13 pages, DACO 2.1, 2.11,1, 2.11.2, 2.11.3, 2.11.4, 2.12.1, 2.12.2, 2.13.1, 2.13.2, 2.13.3, 2.14.1, 2.14.10, 2.14. 11, 2.14.12, 2.14.13, 2.14.14, 2.14.2, 2.14.3, 2.14.4, 2.14.6, 2.14.7, 2.14.8, 2.14.9, 2 2, 2.3, 2.3.1, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9.
PMRA 1164737	YRC 2894 Assay of Technical Grade Active Ingredient, HPLC- Internal Standard, Analytical method 2005-0006201-97 E, 97/09/25, Bayer, September 30, 1997, 5 pages, DACO 2.13.1.
PMRA 1164738	YRC 2894 Technical, HPLC - Internal Standard, Validation Report VB1-2005-0006201E, Bayer AG, September 29, 1997, 3 pages, DACO 2.13.1.
PMRA 1164739	Determination of 1-Butanol, Assay - GLC - external standard (Headspace), Analytical method 2005-0010201-99-E, 99/11/30, Bayer, November 30, 1999, 4 pages, DACO 2.13.1.
PMRA 1164740	1-Butanol in Active Ingredient Agrochemicals, Headspace GC, Validation Report V01.01-2005-0010201E, Bayer, December 12, 2002, 4 pages, DACO 2.13.1
PMRA 1164742	Amendment 1, Material Accountability of Thiacloprid, (Study No. 15-920-2148) - Structure and Response Factor of Impurity BIS-CIT-CMP, Bayer CropScience, September 4, 2002, 2 pages, DACO 2.13.3.

PMRA 1043905	Analytical Method for the Determination of YRC 2894 and Two Metabolites in Soil by High Performance Liquid-Chromatography Electrospray Tandem Mass Spectrometry (LC-ESI/MS/MS), Laboratory Study No. Y4112101, Report No. 107890, October 29, 1997, 42 pages, DACO 8.2.2.1.
PMRA 1043909	Method 00467 (MR-873/96) for Liquid Chromatographic Determination of YRC 2894 in Sediment, Bayer AG, Study Number: P 60160015, January 29, 1997, 23 pages, DACO 8.2.2.2.
PMRA 1043910	Method for the Determination of YRC 2894 and YRC 2894 Sulfonic Acid in Water from Aquatic Toxicity Tests by HPLC, Bayer AG, Method 00411, MR-843/95, August 9, 1995, 12 pages, DACO 8.2.2.3.
PMRA 1043911	Method for the Determination of KKO 2254 (Amide-YRC 2894) in Test Water from Aquatic Toxicity Tests by HPLC, Bayer AG, Method 00460, MR-765/96, November 13, 1996, 8 pages, DACO 8.2.2.3.

1.2 End-Use Product

PMRA 1287497	Statement of Product Specifiction Form dated 06/08/08, DACO 3.3.2.
PMRA 1044145	Product Chemistry of Calypso® 4F, Bayer Corporation, March 30, 1999, 51 pages, DACO 3.0.
PMRA 1044146	CALYPSP 480 SC Insecticide, Bayer CropScience Inc., Reprot # 05006DC, March 21, 2005, 16 pages, DACO 3.0.
PMRA 1044277	Product Chemistry of CALYPSO™ Flowable Insecticide, Bayer AG, BR 2377, February 1, 2005, 15 pages, DACO 3.0.

2.0 Toxicology

2.1 Studies/Information Submitted by the Registrant

2.1.1 Impact on Human and Animal Health

PMRA 1043813	KKO 2254: Study for acute oral toxicity in rats. Bayer AG Department of Toxicology. Study number: T2060033. Study report date: December 01, 1995. DACO 4.2.1.
PMRA 1043814	YRC 2894: Study for acute oral toxicity in rats. Bayer AG Department of Toxicology. Study number: T3059270. Study report date: August 26, 1996. DACO 4.2.1.

PMRA 1043815	WAK 6999: Study for acute oral toxicity in rats. Bayer AG Department of Toxicology. Study number: T8060110. Study report date: February 2, 1996. DACO 4.2.1.
PMRA 1043816	CIT (2-Cyanimino-I ,3-thiazolidin) (Intermediate for YRC 2894): Study for acute oral toxicity in rats. Bayer AG Department of Toxicology. Study number: T8061092. Study report date: March 10, 1997. DACO 4.2.1
PMRA 1043817	YRC 2894: Acute oral toxicity study in mice. Nihon Bayer Agrochem K.K. Study number: 97219. Study report date: March 6, 1998. DACO 4.2.1.
PMRA 1043818	YRC 2894: Study for acute dermal toxicity in rats. Bayer AG Department of Toxicology. Study Number: T4059271. Study report date: February 15, 1996. DACO 4.2.2.
PMRA 1043819	YRC 2894: Study for acute inhalation toxicity in rats according to OECD No. 403. Bayer AG Department of Toxicology. Study Number: T5058291. Study report date: June 16, 1995. DACO 4.2.3.
PMRA 1043820	YRC 2894: Study for skin and eye irritation/corrosion in rabbits. Bayer AG Department of Toxicology. Study Number: T5059272. Study report date: May 15, 1995. DACO 4.2.4 & 4.2.5.
PMRA 1043806	Validation of Magnusson-Kligman Maximization Test Method used by the Fachbereich Toxikologie, Bayer AG, performed in Guinea Ppgs of the strain Hsd Poc:DH with 2- Mercaptobenzothiazole. Bayer AG. Study number: T1060339. Study report date: January 8, 1996. DACO 4.2.6.
PMRA 1043821	YRC 2894: Study For the Skin Sensitization Effect in Guinea Pigs (Guinea Pig Maximization Test Method According Magnusson and Kligman). Bayer AG Department of Toxicology. Study number: T5060036. Study report date: January 4, 1996. DACO 4.2.6.
PMRA 1043807	YRC 2894: Sub-chronic range-finding study for a two-year study in B6C3F1 mice (administration in feed over about 14 weeks). Bayer AG Department of Toxicology. Study number: T80555885. Study report date: January 30, 1995. DACO 4.3.1.
PMRA 1043808	YRC 2894: Study for subacute oral toxicity in rats (feeding study over 2 weeks). Bayer AG Department of Toxicology. Study number: T6058111. Study report date: November 29, 1996. DACO 4.3.1.

PMRA 1043809 YRC 2894: Pilot study on subacute toxicity in B6C3F1 mice (administration in feed over 3 weeks). Bayer AG Department of Toxicology. Study number: T8055585. Study report date: August 18, 1998. DACO 4.3.1.

PMRA 1043810 YRC 2894: Study for subacute oral toxicity in mice (feeding study over 2 weeks). Bayer AG Department of Toxicology. Study Number: T7058112. Study report date: February 12, 1997. DACO 4.3.1.

PMRA 1043811 Investigations of subchronic toxicity in Wistar rats (feeding study over 12 weeks with a subsequent recovery period over 5 weeks). Bayer AG Department of Toxicology. Study number: T9055540. Study report date: March 21, 1997. Part 1 of 3. DACO 4.3.1.

PMRA 1043812 Investigations of subchronic toxicity in Wistar rats (feeding study over 12 weeks with a subsequent recovery period over 5 weeks). Bayer AG Department of Toxicology. Study number: T9055540. Study report date: March 21, 1997. Part 2 of 3. DACO 4.3.1.

PMRA 1043822 Investigations of subchronic toxicity in Wistar rats (feeding study over 12 weeks with a subsequent recovery period over 5 weeks). Bayer AG Department of Toxicology. Study number: T9055540. Study report date: March 21, 1997. Part 3 of 3. DACO 4.3.1.

PMRA 1043825 YRC 2894: Special study for subacute oral toxicity in rats (toxicokinetics in pregnant and non-pregnant rats). Bayer AG Department of Toxicology. Study number: T3061538. Study report date: July 14, 1998. Unpublished. DACO 4.3.1.

PMRA 1043830 YRC 2894 (c.n.: Thiacloprid): Special study for subacute oral toxicity in rats (feeding study for 3 weeks). Bayer AG Department of Toxicology. Study number: T5069235. Study report date: March 10, 2000. DACO 4.3.1.

PMRA 1043831 2-Cyanimino-l,3-thizolidin (Intermediate of YRC 2894): Study for subacute oral toxicity in rats (four-week application by gavage). Bayer AG, Department of Toxicology. Study number: T5061819. Study report date: July 7, 1998. Part 1 of 2. DACO 4.3.1.

PMRA 1043832 2-Cyanimino-l,3-thizolidin (Intermediate of YRC 2894): Study for subacute oral toxicity in rats (four-week application by gavage). Bayer AG, Department of Toxicology. Study number: T5061819. Study report date: July 7, 1998. Part 3 of 2. DACO 4.3.1.

PMRA 1043833	YRC 2894: Pilot toxicity study on rats - acute oral toxicity to non-fasted animals, subacute oral toxicity with gavage administration over 2 weeks. Bayer AG Department of Toxicology. Study number: T9055423 & T4055536. Study report date: March 15, 1995. DACO 4.3.1.
PMRA 1044572	Supplemental submission to AC No. 106868, YRC 2894: Sub-chronic range-finding study for a two-year study in B6C3F1 mice (administration in feed over about 14 weeks). Bayer AG Department of Toxicology. Study number: T8055585. Study report date: August 18, 1998. DACO 4.3.1.
PMRA 1043836	YRC 2894 - Subacute toxicity study in Beagle dogs (dose range finding study by feed admixture over at least 10 weeks) - revised final version. Bayer AG Institute for Toxicology. Study number: T8055594. Study report date: February 11, 1999. Part 1 of 2. DACO 4.3.2
PMRA 1043823	YRC 2894 - Subacute toxicity study in Beagle dogs (dose range finding study by feed admixture over at least 10 weeks) - revised final version. Bayer AG Institute for Toxicology. Study number: T8055594. Study report date: February 11, 1999. Part 2 of 2. DACO 4.3.2
PMRA 1043824	YRC 2894: Chronic toxicity study in Beagle dogs (52-week feeding study). Bayer AG Department of Toxicology. Study number: T1060654. Study report date: June 5, 1998. Part 1 of 3. DACO 4.3.2.
PMRA 1043826	YRC 2894: Chronic toxicity study in Beagle dogs (52-week feeding study). Bayer AG Department of Toxicology. Study number: T1060654. Study report date: June 5, 1998. Part 1 of 3. DACO 4.3.2.
PMRA 1043827	YRC 2894: Chronic toxicity study in Beagle dogs (52-week feeding study). Bayer AG Department of Toxicology. Study number: T1060654. Study report date: June 5, 1998. Part 1 of 3. DACO 4.3.2.
PMRA 1043834	YRC 2894: Subchronic toxicity study in Beagle dogs (feeding study for about 15 weeks). Bayer AG, Department of Toxicology. Stduy number:. T0058331. Study report date: May 4, 1998. Part 1 of 2 DACO 4.3.2.
PMRA 1043835	YRC 2894: Subchronic toxicity study in Beagle dogs (feeding study for about 15 weeks). Bayer AG, Department of Toxicology. Study number: T0058331. Study report date: May 4, 1998. Part 2 of 2 DACO 4.3.2.
PMRA 1043828	YRC 2894: Study for subacute dermal toxicity in rats (four-week treatment and two-week recovery period). Bayer AG Department of Toxicology. Study number: T3060007. Study report date: January 30, 1997. DACO 4.3.5.

PMRA 1043829 YRC 2894: Pilot study on subacute inhalation toxicity on rats (exposure: 5 × 6 hours). Bayer AG Department of Toxicology. Study number: T00583. Study report date: July 13, 1995. Part 1 of 2. DACO 4.3.6.

PMRA 1043837 YRC 2894: Pilot study on subacute inhalation toxicity on rats (exposure: 5 x 6 hours). Bayer AG Department of Toxicology. Study number: T00583. Study report date: July 13, 1995. Part 2 of 2. DACO 4.3.6.

PMRA 1043838 YRC 2894: Subacute inhalation toxicity on rats (exposure 5 x 6 hours/week for 4 weeks). Bayer AG Department of Toxicology. Study number: T1061509. Study report date: June 17, 1998. Part 1 of 3. DACO 4.3.6.

PMRA 1043839 YRC 2894: Subacute inhalation toxicity on rats (exposure 5 x 6 hours/week for 4 weeks). Bayer AG Department of Toxicology. Study number: T1061509. Study report date: June 17, 1998. Part 2 of 3. DACO 4.3.6.

PMRA 1043840 YRC 2894: Subacute inhalation toxicity on rats (exposure 5 x 6 hours/week for 4 weeks). Bayer AG Department of Toxicology. Study number: T1061509. Study report date: June 17, 1998. Part 3 of 3. DACO 4.3.6.

PMRA 1043841 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 1 of 8. DACO 4.4.2.

PMRA 1043842 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 2 of 8. DACO 4.4.2.

PMRA 1043843 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 3 of 8. DACO 4.4.2.

PMRA 1043844 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 4 of 8. DACO 4.4.2.

PMRA 1043845 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 5 of 8. DACO 4.4.2.

PMRA 1043846 YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 6 of 8. DACO 4.4.2.

PMRA 1043847	YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 7 of 8. DACO 4.4.2.
PMRA 1043848	YRC 2894: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). Bayer AG. Study number: T9059195. Study report date: February 26, 1998. Part 8 of 8. DACO 4.4.2.
PMRA 1043849	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 1 of 11. DACO 4.4.4
PMRA 1043850	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 2 of 11. DACO 1.4.4
PMRA 1043851	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 3 of 11. DACO 4.4.4
PMRA 1043852	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 4 of 11. DACO 4.4.4
PMRA 1043866	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 5 of 11. DACO 4.4.4
PMRA 1043867	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report dat: May 13, 1998. Part 6 of 11. DACO 4.4.4
PMRA 1043853	YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 7 of 11. DACO 4.4.4

PMRA 1043854 YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 8 of 11. DACO 4.4.4

PMRA 1043855 YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 9 of 11. DACO 4.4.4

PMRA 1043856 YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 10 of 11. DACO 4.4.4

PMRA 1043857 YRC 2894: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). Bayer AG Institute of Toxicology. Study number: T7059067. Study report date: May 13, 1998. Part 11 of 11. DACO 4.4.4

PMRA 1043858 YRC 2894 - Rationale for dose selection for a combined chronic toxicity/oncogenicity study in rats. Bayer AG, Fachbereich Toxikologie. Study report date: November 22, 1994. DACO 4.4.4.

PMRA 1043859 A two-generation reproduction range-finding study with YRC-2894 technical in rats. Miles Inc. Stucy number: MTD9425RH24084. Study report date: May 25,1995. DACO 4.5.1.

PMRA 1043860 A two-generation dietary reproduction study in rats using technical YRC 2894. Bayer Corporation. Study number: 95-672-FV. Study report date: December 8, 1997. Part 1 of 4. DACO 4.5.1.

PMRA 1043861 A two-generation dietary reproduction study in rats using technical YRC 2894. Bayer Corporation. Study number:. 95-672-FV. Study report date: December 8, 1997. Part 2 of 4. DACO 4.5.1.

PMRA 1043862 A two-generation dietary reproduction study in rats using technical YRC 2894. Bayer Corporation. Study number: 95-672-FV. Study report date: December 8, 1997. Part 3 of 4. DACO 4.5.1.

PMRA 1043863 A two-generation dietary reproduction study in rats using technical YRC 2894. Bayer Corporation. Study number: 95-672-FV. Study report date: December 8, 1997. Part 4 of 4. DACO 4.5.1.

PMRA 1043864	A reproduction study in rats to determine if administration of technical YRC 2894 from gestation days 18 to 21 will cause Dystocia (Study number II). Bayer Corporation Agriculture Division Toxicology. Study number: 96-912-JK. Study report date: May 4, 1998. DACO 4.5.1.
PMRA 1043865	A reproduction study in rats to determine if administration of technical YRC 2894 from gestation days 18 to 21 will cause Dystocia. Bayer Corporation Agriculture Division Toxicology. Study number: 96-972-ID. Study report date: July 24, 1998. DCO 4.5.1.
PMRA 1043868	An experimental study to investigate the cause of dystocia and stillbirths in rats treated with technical grade YRC 2894. Bayer Corporation Agricultural Division Toxicology. Study number: 96-972-JE. Study report date: September 2, 1998. DACO 4.5.1.
PMRA 1043875	A one-generation dietary reproduction study in rats using technical grade YRC 2894 to evaluate the reproducibility of dystocia and an increase in stillbirths in the P generation of a two-generation dietary reproduction study in rats. Bayer Corporation Agriculture Division Toxicology. Study number: 96-972-12. Study report date: May 12, 1998. DACO 4.5.1.
PMRA 1043876	Further examination of the increased occurrence of dystocia and stillbirths observed in a reproductive bioassay with an experimental cyanamide (YRC 2894). Bayer Corporation. Study number: 96-972-KF. Study report date: August 31, 1998. Part 1 of 2. DACO 4.5.1.
PMRA 1043877	Further examination of the increased occurrence of dystocia and stillbirths observed in a reproductive bioassay with an experimental cyanamide (YRC 2894). Bayer Corporation. Study number: 96-972-KF. Study report date: August 31, 1998. Part 2 of 2. DACO 4.5.i.
PMRA 1043890	An acute oral neurotoxicity screening study with technical grade YRC 2894 in Fischer 344 rats. Bayer Corporation, Agriculture Division, Toxicology. Study number: 95-412-GI, 97-912-MD. Study report date: May 12, 1997. DACO 4.5.12. Part 1 of 2.
PMRA 1043891	An acute oral neurotoxicity screening study with technical grade YRC 2894 in Fischer 344 rats. Bayer Corporation, Agriculture Division, Toxicology. Study number: 95-412-GI, 97-912-MD. Study report date: May 12, 1997. DACO 4.5.12. Part 2 of 2.
PMRA 1043892	A subchronic neurotoxicity screening study with technical grade YRC 2894 in Fischer 344 rats. Bayer Corporation, Agriculture Division, Toxicology. Study number: 95-472-DJ. Study report date: June 3, 1997. Part 1 of 2. DACO 4.5.13.

PMRA 1043893 A subchronic neurotoxicity screening study with technical grade YRC 2894 in Fischer 344 rats. Bayer Corporation, Agriculture Division, Toxicology. Study number: 95-472-DJ. Study report date: June 3, 1997. Part 2 of 2. DACO 4.5.13.

PMRA 1043894 Oral (diet) developmental neurotoxicity study of YRC 2894 in CRL:CD(SD)IGS BR VAF/PLUS. Argus Research Laboratories, Inc. Study number: 99C-D72-ER. Study report date: September 24, 2001. Part 1 of 4. DACO 4.5.14.

PMRA 1043895 Oral (diet) developmental neurotoxicity study of YRC 2894 in CRL:CD(SD)IGS BR VAF/PLUS. Argus Research Laboratories, Inc. Study number: 99C-D72-ER. Study report date: September 24, 2001. Part 2 of 4. DACO 4.5.14.

PMRA 1043896 Oral (diet) developmental neurotoxicity study of YRC 2894 in CRL:CD(SD)IGS BR VAF/PLUS. Argus Research Laboratories, Inc. Study number: 99C-D72-ER. Study report date: September 24, 2001. Part 3 of 4. DACO 4.5.14.

PMRA 1043897 Oral (diet) developmental neurotoxicity study of YRC 2894 in CRL:CD(SD)IGS BR VAF/PLUS. Argus Research Laboratories, Inc. Study number: 99C-D72-ER. Study report date: September 24, 2001. Part 4 of 4. DACO 4.5.14.

PMRA 1043869 YRC 2894: Developmental toxicity study in rats after oral administration. Bayer AG. Study number: T2055246. Study report date: February 13, 1997. Part 1 of 3. DACO 4.5.2.

PMRA 1043870 YRC 2894: Developmental toxicity study in rats after oral administration. Bayer AG. Study number: T2055246. Study report date: February 13, 1997. Part 2 of 3. DACO 4.5.2.

PMRA 1043871 YRC 2894: Developmental toxicity study in rats after oral administration. Bayer AG. Study number: T2055246. Study report date: February 13, 1997. Part 3 of 3. DACO 4.5.2.

PMRA 1043872 YRC 2894: Developmental toxicity study in rabbits after oral administration. Bayer AG Department of Toxicology. Study number: T5059074. Study report date: January 9, 1996. Part 1 of 2. DACO 4.5.3.

PMRA 1043873 YRC 2894: Developmental toxicity study in rabbits after oral administration. Bayer AG Department of Toxicology. Study number: T5059074. Study report date: January 9, 1996. Part 1 of 2. DACO 4.5.3.

PMRA 1043874	YRC 2894: Reverse mutation assay (Salmonella typhimurium and Escherichia coli). Nihon Bayer Agrochem K.K. Study number: 95A011. Study report date: August 21, 1995. DACO 4.5.4.
PMRA 1043878	YRC 2894: Salmonella/Microsome Test. Bayer AG Department of Toxicology. Study number: T4049371. Study report date: February 13, 1995. DACO 4.5.4.
PMRA 1043879	YRC 2894: Salmonella/Microsome Test: Plate incorporation and preincubation method. Bayer AG Department of Toxicology. Study number T5054097. December 9, 1994. DACO 4.5.4.
PMRA 1043880	KKO 2254: Salmonella/Microsome Test: Plate incorporation and preincubation method. Bayer AG Department of Toxicology. Study number: T1053977. Study report date: October 31, 2995. DACO 4.5.4.
PMRA 1043881	WAK 6999: Salmonella/Microsome Test: Plate incorporation and preincubation method. Bayer AG Department of Toxicology. Study number: T8053974. Study report date: October 26, 1995. DACO 4.5.4.
PMRA 1043882	YRC 2894: DNA repair test in bacterial system. Nihon Bayer Agrochem K.K. Study number: 97220. Study report date: January 8, 1998. DACO 4.5.4.
PMRA 1043883	YRC 2894: Mutagenicity study for the detection of induced forward mutations in the V79-HPRT assay in vitro. Bayer AG Department of Toxicology. Study number: T7054080. Study report date: June 11, 1996. DACO 4.5.6.
PMRA 1043884	YRC 2894: In vitro mammalian chromosome aberration test with Chinese hamster V79 cells. Bayer AG Department of Toxicology. Study number: T5054079. Study report date: November 23, 1995. DACO 4.5.6.
PMRA 1043885	YRC 2894: Micronucleus test on the mouse. Bayer AG Department of Toxicology. Study number: T0059051. Study report date: November 23, 1995. DACO 4.5.7.
PMRA 1043886	YRC 2894: Test of unscheduled DNA synthesis in rat liver primary cell cultures in vitro. Bayer AG Department of Toxicology. Study number: T8054081. Study report date: September 10, 1996. DACO 4.5.8.
PMRA 1043887	[Methylene-14C]YRC 2894: General rat metabolism Part A: Distribution of the total radioactivity in the rat determined by conventional wholebody autoradiography and radioluminography. Bayer AG. Study number: M01819029. Study report date: June 26, 1996. DACO 4.5.9.

PMRA 1043888 [Thiazolidine-4,5-^{14}C] YRC 2894: Absorption, distribution, excretion and metabolism in the rat. Bayer AG. Study number: M81819036. Study report date: December 8, 1997. DACO 4.5.9.

PMRA 1043889 [Methylene-^{14}C] YRC 2894: General rat metabolism study. Part B: Toxicokinetics and metabolism in the rat. Bayer AG. Study number: M01819029. Study report date: February 5, 1998. DACO 4.5.9.

PMRA 1043790 YRC 2894: Determination of aromatase activity in ovary and liver tissue of a modified 1-generation reproductive study in Sprague-Dawley rats. Bayer AG. Study number: PH-277 18E6062080. Study report date: July 27, 1998. DACO 4.8.

PMRA 1043791 YRC 2894: Investigation of the inhibition of cytochrome P450 dependent monooxygenases in liver microsomes (in vitro). Bayer AG Department of Toxicology. Study number: T6053684. Study report date: July 21, 1998. DACO 4.8.

PMRA 1043792 YRC 2894: Mechanistic studies on aromatase induction and toxicokinetics in rats (4-week feeding studies). Bayer AG Department of Toxicology. Study number: T 3062311. Study report date: July 27, 1998. DACO 4.8

PMRA 1043793 YRC 2894: Mechanistic studies on aromatase induction in mice (feeding study for 13 weeks). Bayer AG, Department of Toxicology. Study number: T7061541. Study report date: July 27, 1998. Part 1 of 2. DACO 4.8.

PMRA 1043794 YRC 2894: Mechanistic studies on aromatase induction in mice (feeding study for 13 weeks). Bayer AG, Department of Toxicology. Study number: T7061541. Study report date: July 27, 1998. Part 2 of 2. DACO 4.8.

PMRA 1043795 YRC 2894: Studies on the inhibition of thyroid peroxidase-catalyzed reactions by YRC 2894 and its metabolites in vitro. Bayer AG, Research Toxicology. Study report number: 23495A. Study report date: January 28, 1999. DACO 4.8.

PMRA 1043796 Cancer hazard assessment and characterization of YRC 2894. Bayer Corporation. Study report number: 108890. Study report date: September 22, 1998. DACO 4.8.

PMRA 1043797 YRC 2894 Position paper - toxicological overview and discussion of mechanistic investigation. Bayer Corporation. Study report number: 108961. Study report date: march 25, 1999. DACO 4.8.

PMRA 1043898 A revised liquid chromatographic method for the determination of YRC 2894 in animal ration. Bayer Corporation. Study number: 95-899-DU. Study report date: January 11, 1996; revised April 22, 1997. DACO 4.8.

PMRA 1043899 The homogeneity and stability of YRC 2894 in rodent ration. Bayer Corporation. Study number: 95-872-EF, 96-872-KI. Study report date: January 13, 1998. DACO 4.8.

PMRA 1044148 YRC 480 SC 05776/0071: Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Study number: T8061849. Study report date: March 19, 1998. DACO 4.6.1.

PMRA 1044149 YRC 2894 480 SC 05776/0071: Study for acute dermal toxicity in rats. Bayer AG, Department of Toxicology. Study number: T0061850. Study report date: March 19, 1998. DACO 4.6.2.

PMRA 1044150 YRC 2894 480 SC 05776/0096 (c.n.: Thiacloprid): Study for acute inhalation toxicity in rats according to OECD No. 403. Bayer AG Department of Toxicology. Study number: T6067418. Study report date: April 24, 1999. DACO 4.6.3.

PMRA 1044151 Acute eye irritation study of YRC 2894 480 SC 05776/0071 by instillation into the conjunctival sac of rabbits. LPT Laboratory of Pharmacology and Toxicology. Study number: T3061196. Study report date: October 21, 1998. DACO 4.6.4.

PMRA 1044152 Acute skin irritation (patch test) of YRC 2894 4480 SC 05776/0070 in rabbits. LPT Laboratory of Pharmacology and Toxicology. Study number: T3061196. Study report date: September 29, 1998. DACO4.6.5.

PMRA 1044153 YRC 2894 480 SC 05776/0071: Study for skin sensitization effect in Guinea pigs (Buehler patch test). Bayer AG Department of Toxicology. Study number: T4061890. Study report date: May 12, 1998. DACO 4.6.6.

PMRA 1044154 YRC 2894 480 SC 05776/0096: Study for skin sensitization effect in Guinea pigs (Buehler patch test). Bayer AG Department of Toxicology. Study number: T4068749. Study report date: January 25, 2000. DACO 4.6.6.

PMRA 1044155 YRC 2894 480 SC: Skin sensitization effect in Guinea pigs (Guinea pig maximization test according to Magnusson and Kligman). Bayer AG Department of Toxicology. Study number: T2070186. Study report date: April 24, 2001. DACO 4.6.6.

PMRA 1044156 Validation of the Magnusson- Kligman Maximization Test Method Used by the Fachbereich Toxikologie, Bayer AG, Performed in Guinea Pigs Off the Strain Hsd Poc:DH With 2- Mercaptobenzothiazole. Bayer AG. Study number: T1062427 Study report date: May 19, 1998. DACO 4.6.6.

PMRA 1044157	Validation of the Buehler Patch Test Method Used by the Fachbereich Toxikologie, Bayer AG, Performed In Guinea Pigs of the Strain Hsd Poc:DH With Alpha Hexyl Cinnamic Aldehyde (Buehler Patch Test). Bayer AG. Study number: T6068200. Study report date: June 23, 2999. DACO 4.6.6.

2.2 List of Unpublished Information Considered

2.2.1 Impact on Human and Animal Health

PMRA 1043725	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for the skin sensitization effect in guinea pigs (guinea pig maximization test method according Magnusson and Kligman). PC Code 014019. MRID number 44927733. Office of Pesticide Progams. Washington, DC.
PMRA 1043726	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Pilot study on subacute toxicity in B6C3F1 mice (administration in feed over 3 weeks). PC Code 014019. MRID number 44927736. Office of Pesticide Programs. Washington, DC.
PMRA 1043727	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for subacute oral toxicity in mice (feeding study over 2 weeks). PC Code 014019. MRID number 44927740. Office of Pesticide Programs. Washington, DC.
PMRA 1043728	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Pilot toxicity study on rats - acute oral toxicity to non-fasted animals, subacute oral toxicity with gavage administration over 2 weeks. PC Code 014019. MRID number 44927644. Office of Pesticide Programs. Washington, DC.
PMRA 1043729	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Investigations of subchronic toxicity in Wistar rats (feeding study over 12 weeks with a subsequent recovery period over 5 weeks). PC Code 014019. MRID number 44927714. Office of Pesticide Programs. Washington, DC.
PMRA 1043730	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for subacute oral toxicity in rats (feeding study over 2 weeks). PC Code 014019. MRID number 44927734. Office of Pesticide Programs. Washington, DC.
PMRA 1043731	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Special study for subacute oral toxicity in rats (feeding study for 3 weeks). PC Code 014019. MRID number 45307403. Office of Pesticide Programs. Washington, DC.

PMRA 1043732 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: 2-Cyanimino-1,3-thizolidin (Intermediate of YRC 2894): Study for subacute oral toxicity in rats (four-week application by gavage). PC Code 014019. MRID number 45307408. Office of Pesticide Programs. Washington, DC.

PMRA 1043733 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Subchronic range-finding study for a two-year study in B6C3F1 mice (administration in feed over about 14 weeks). PC Code 014019. MRID number 44927633 & 44927634. Office of Pesticide Programs. Washington, DC.

PMRA 1043734 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Chronic toxicity study in Beagle dogs (52-week feeding study). PC Code 014019. MRID number 44927716. Office of Pesticide Programs. Washington, DC.

PMRA 1043735 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Subchronic toxicity study in Beagle dogs (feeding study for about 15 weeks). PC Code 014019. MRID number 44927709. Office of Pesticide Programs. Washington, DC.

PMRA 1043736 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for subacute dermal toxicity in rats (four-week treatment and two-week recovery period). PC Code 014019. MRID number 44927701. Office of Pesticide Programs. Washington, DC.

PMRA 1043737 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Subacute inhalation toxicity on rats (exposure 5 x 6 hours/week for 4 weeks). PC Code 014019. MRID number 44927715. Office of Pesticide Programs. Washington, DC.

PMRA 1043738 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Pilot study on subacute inhalation toxicity in rats (exposure: 5 x 6 hours). PC Code 014019. MRID number 44927636. Office of Pesticide Programs. Washington, DC.

PMRA 1043739 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Oncogenicity study in B6C3F1 mice (administration in the food over 2 years). PC Code 014019. MRID number 44927740 & 44927741. Office of Pesticide Programs. Washington, DC.

PMRA 1043740 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Combined chronic toxicity carcinogenicity study in Wistar rats (dietary administration over 2 years). PC Code 014019. MRID number 44927712. Office of Pesticide Programs. Washington, DC.

PMRA 1043741 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: An experimental study to investigate the cause of dystocia and stillbirths in rats treated with technical grade YRC 2894. PC Code 014019. MRID number 45159305. Office of Pesticide Programs. Washington, DC.

PMRA 1043742 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Further examination of the increased occurrence of dystocia and stillbriths observed in a reproductive bioassay with an experimental cyanimide (YRC 2894). PC Code 014019. MRID number 44927713. Office of Pesticide Programs. Washington, DC.

PMRA 1043743 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Supplemental submission: A reproduction study in rats to determine if administration of technical YRC 2894 from gestation days 18 to 21 will cause dystocia. PC Code 01401. MRID number 45227202. Office of Pesticide Programs. Washington, DC.

PMRA 1043744 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A two-generation dietary reproduction study in rats using technical YRC 2894. PC Code 014019. MRID number 44927702. Office of Pesticide Programs. Washington, DC.

PMRA 1043745 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A two-generation reproduction range-finding study with YRC 2894 technical in rats. PC Code 014019. MRID number 44927638. Office of Pesticide Programs. Washington, DC.

PMRA 1043746 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Developmental toxicity study in rats after oral administration. PC Code 014019. MRID number 44927741. Office of Pesticide Programs. Washington, DC.

PMRA 1043747 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Developmental toxicity study in rabbits after oral administration. PC Code 014019. MRID number 44939201. Office of Pesticide Programs. Washington, DC.

PMRA 1043748 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Reverse mutation assay (Salmonella typhimurium and Escherichia coli). PC Code 014019. MRID number 44927643. Office of Pesticide Programs. Washington, DC.

PMRA 1043749 USEPA. 2002. Data Evaluation Record for YRC 2498. Study Title: Salmonella/microsome test. PC Code 014019. MRID number 45307401. Office of Pesticide Programs. Washington, DC.

PMRA 1043750 USEPA. 2002. Data Evaluation Record for KKO 2254. Salmonella/Microsome Test: Plate incorporation and preincubation method. PC Code 014019. MRID number 45307405. Office of Pesticide Programs. Washington, DC.

PMRA 1043751 USEPA. 2002. Data Evaluation Record for WAK 6999. Study Title: Salmonella/Microsome Test: Plate incorporation and preincubation method. PC Code 014019. MRID number 45307406. Office of Pesticide Programs. Washington, DC.

PMRA 1043752 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Salmonella/Microsome Test: Plate incorporation and preincubation method .PC Code 014019. MRID number 45307402. Office of Pesticide Programs. Washington, DC.

PMRA 1043753 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Bacterial DNA damage/repair in Bacillus subtilis. PC Code 014019. MRID number 45344001. Office of Pesticide Programs. Washington, DC.

PMRA 1043754 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A reproduction study inr ats to determine if administration of technical YRC 2894 from gestation days 18 to 21 will cause dystocia. PC Code 014019. MRID number 44927705. Office of Pesticide Programs. Washington, DC.

PMRA 1043755 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A reproduction study in rats to determine if administration of technical YRC 2894 from gestation days 18 to 21 will cause dystocia (Study number II) PC Code 014019. MRID number 44927706. Office of Pesticide Programs. Washington, DC.

PMRA 1043756 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A one-generation dietary reproduction study in rats using technical grade YRC 2894 to evaluate the reproducibility of dystocia and an increase in stillbirths in the P generation of a two-generation dietary reproduction study in rats. PC Code 014019. MRID number 44927707. Office of Pesticide Programs. Washington, DC.

PMRA 1043757 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: In vitro mammalian chromosome aberration test with Chinese hamster V79 cells. PC Code 014019. MRID number 44927642. Office of Pesticide Programs. Washington, DC.

PMRA 1043758 USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Mutagenicity study for the detection of induced forward mutations in the V79/HPRT assay in vitro. PC Code 014019. MRID number 44927739. Office of Pesticide Programs. Washington, DC.

PMRA 1043759	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Micronucleus test on the mouse. PC Code 014019. MRID number 44927641. Office of Pesticide Programs. Washington, DC.
PMRA 1043760	USEPA Data Evaluation Record for YRC 2894. Study Title: Test of unscheduled DNA synthesis in rat liver primary cell cultures in vitro. PC Code 014019. MRID number 44927738. Office of Pesticide Programs. Washington, DC.
PMRA 1043761	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Distribution of the total radioactivity in the rat determined by conventional whole-body autoradiography and radioluminography PC Code 014019. MRID number 44927605. Office of Pesticide Programs. Washington, DC.
PMRA 1043762	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: General rat metabolism study Part B: Toxicokinetics and metabolism in the rat. PC Code 014019. MRID number 44927609. Office of Pesticide Programs. Washington, DC.
PMRA 1043763	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Absorption, distribution, excretion and metabolism in the rat. PC Code 014019. MRID number 44927612. Office of Pesticide Programs. Washington, DC.
PMRA 1043764	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: An acute oral neurotoxicity screening study with technical grade YC 2894 in Fischer 344 rats. PC Code 014019. MRID number 1043764. Office of Pesticide Programs. Washington, DC.
PMRA 1043765	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A special acute oral neurotoxicity study to establish a no-observed effect level with technical grade YRC 2894 in Fischer 344 rats. PC Code 014019. MRID number 44927704. Office of Pesticide Programs. Washington, DC.
PMRA 1043766	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: A subchronic neurotoxicity screening study with technical grade YRC 2894 in Fischer 344 rats. PC Code 014019. MRID number 44927645. Office of Pesticide Programs. Washington, DC.
PMRA 1043767	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Oral (diet) deevelopmental neurotoxicity study of YRC 2894 in CRL:CD(SD)IGS BR VAF/PLUS. PC Code 014019. MRID number 45516601. Office of Pesticide Programs. Washington, DC.

PMRA 1043768	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Determination of aromatase activity in ovary and liver tissue of a modified 1-generation reproductive study in Sprague Dawley rats. PC Code 014019. MRID number 44927718. Office of Pesticide Programs. Washington, DC.
PMRA 1043769	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Mechanistic studies on aromatase induction and toxicokinetics in rats (4-week feeding studies). PC Code 014019. MRID number 44927720. Office of Pesticide Programs. Washington, DC.
PMRA 1043770	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Mechanistic study on aromatase induction in mice (feeding study for 13 weeks). PC Code 014019. MRID number 44927722. Office of Pesticide Programs. Washington, DC.
PMRA 1043798	USEPA. 2002. Data Evaluation Record for WAK 6999. Study Title: Study for acute oral toxicity in rats. PC Code 014019. MRID number 44927737. Office of Pesticide Programs. Washington, DC.
PMRA 1043799	USEPA. 2002. Data Evaluation Record for KKO 2254. Study Title: Study for acute oral toxicity in rats. PC Code 014019. MRID number 44927404. Office of Pesticide Programs. Washington, DC.
PMRA 1043800	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Acute oral toxicity study in mice. PC Code 014019. MRID number 45344002. Office of Pesticide Programs. Washington, DC.
PMRA 1043801	USEPA. 2002. Data Evaluation Record for CIT (2-Cyanimino-I ,3-thiazolidin). Study Title: Study for acute oral toxicity in rats. PC Code 014019. MRID number 45307407. Office of Pesticide Programs. Washington, DC.
PMRA 1043802	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for acute dermal toxicity in rats. PC Code 014019. MRID number 44927731. Office of Pesticide Programs. Washington, DC.
PMRA 1043803	USEPA. 2002. Data Evaluation Record for YRC 2894. Study Title: Study for acute inhalation toxicity in rats accoording to OECD No. 403. PC Code 014019. MRID number 44927732. Office of Pesticide Programs. Washington, DC.
PMRA 1043804	U.S. EP. 2002. Data Evaluation Record of YRC 2894 (eye irritation). Study Title: Study for skin and eye irritation/corrosion in rabbits. PC Code 014019. MRID number 44927635. Office of Pesticide Programs. Washington, DC.

PMRA 1043958 USEPA. 2003. Cancer Briefing Package. Date of Package: January 14, 2003. PC Code 014019. Office of Pesticide Programs. Washington, DC.

PMRA 1260144 USEPA. 2003. Thiacloprid: Toxicology Chapter for the Registration Support Document. Review of the subchronic, chronic, developmental, reproductive, carcinogenicity, neurotoxicity and metabolism data bases and special studies attempting to support a mechanism for the carcinogenic effects and other supporting documents. Date of document: July 7, 2003. PC Code 014019. Office of Pesticide Programs. Washington, DC.

PMRA 1260150 USEPA. 2003. Mechanism of Toxicity SARC Report: Thiacloprid. Date of document: February 19, 2003. PC Code 014019. Office of Pesticide Programs. Washington, DC.

PMRA 1251399 USEPA. 2002. Data Evaluation Record for YRC 2894 (dermal irritation). Study Title: Study for skin and eye irritation/corrosion in rabbits. PC Code 014019. MRID number 44927635. Office of Pesticide Programs. Washington, DC.

PMRA 1044158 USEPA. Data Evaluation Record for YRC 480 SC 05776/0071. Study Title: Study for acute oral toxicity in rats. PC Code 014019. MRID number 44927723. Office of Pesticide Programs. Washington, DC.

PMRA 1044159 USEPA. 2002. Data Evaluation Record for YRC 2894 480 SC 05776/0096. Study Title: Study for acute inhalation toxicity in rats according to OECD No. 403. PC Code 014019. MRID number 44927728. Office of Pesticide Programs. Washington, DC.

PMRA 1044161 USEPA. 2002. Data Evaluation Record for YRC 2894 4480 SC 05776/0070. Study Title: Acute skin irritation (patch test) of YRC 2894 4480 SC 05776/0070 in rabbits. PC Code 014019. MRID number 44927724. Office of Pesticide Programs. Washington, DC.

PMRA 1044162 USEPA. 2003. Memorandum dated June 16, 2003, for Calypso 240F. Follow up on the study for the skin sensitization effect in guinea pigs (guinea pig maximization test method according Magnusson and Kligman). PC Code 014019. Office of Pesticide Programs. Washington, DC.

PMRA 1044163 USEPA. 2002. Data Evaluation Record for YRC 2894 480 SC 05776/0071. Study Title: Study for skin sensitization effect in Guinea pigs (Buehler patch test). PC Code 014019. MRID number 44927725. Office of Pesticide Programs. Washington, DC

PMRA 1044165	USEPA. 2002. Data Evaluation Record for YRC 2894 480 SC 05776/0096. Study Title: Study for skin sensitization effect in Guinea pigs (Buehler patch test). PC Code 014019. MRID number 45307409. Office of Pesticide Programs. Washington, DC
PMRA 1044166	USEPA. 2004. Memorandum dated April 6, 2003 for Calypso 240F. PC Code 014019. Office of Pesticide Programs. Washington, DC.
PMRA 1044313	USEPA. 2002. Data Evaluation Record for YRC 2894 480 SC 05776/0071. Study Title: Study for acute dermal toxicity in rats. PC Code014019. MRID number 44927726. Office of Pesticide Programs. Washington, DC.

3.0 Occupational Exposure Assessment Section

PMRA 1247105	A Study to Determine the Dermal Absorption of Carbon 14 YR 28794 in SC 480 Formulation when Administered Dorsally to Male Rhesus Monkeys. 30-December-02. Bayer Report Number 200436. DAC0 5.8
PMRA 1251222	CALYPSO 4F - Dissipation of Dislodgeable Foliar Residues in Apple Tree Foliage. 13-January-04. Bayer Study Number Y4251601. Bayer Report Number 200479. DACO 5.9

4.0 Food Residue Exposure Assessment Section

PMRA 1043776	[Methylene-^{14}C]YRC 2894: Absorption, Distribution, Excretion and Metabolism in the Lactating Goat. Bayer Report No. 108707 (PF4372). Study report date:24-Jun-98. 275 pages. DACO 6.2
PMRA 1043772	[Methylene-^{14}C]YRC 2894 Absorption, Distribution, Excretion and Metabolism in Laying Hens. Bayer Study No. M 01819038. Bayer Report No. 108483. Study report date: 15-Mar-99. 152 pages. DACO 6.2
PMRA 1043780	Metabolism of [Pyridinyl-^{14}C-Methyl]YRC 2894 in Apples. Bayer Report No. 107944 (PF 4306). Study report date:02-Oct-97. 55 pages. DACO 6.3
PMRA 1043781	Metabolism of YRC 2894 in Tomatoes. Bayer Study No. M 1730631-1. Bayer Report No. 107908. Study report date:15-Aug-97. 83 pages. DACO 6.3
PMRA 1043782	Translocation of [Pyridinyl-^{14}C-Methyl]YRC 2894 in Tomato Plants. Supplemental Study in Support of Metabolism of YRC 2894 in Tomatoes. Bayer Study No. M1720696-1. Bayer Report No. 107908-1.Study report date: 19-Aug-97. 27 pages. DACO 6.3

PMRA 1043783 Metabolism of YRC 2894 in Cotton. Bayer Report No. 108289 (PF4256). Study report date: 16-Mar-98. 234 pages. DACO 6.3

PMRA 1043779 Metabolism of [Pyridinyl-^{14}C-Methyl]YRC 2894 in Rice. Bayer Report No. 108333 (PF 4343). Study report date: 25-Feb-98. 91 pages. DACO 6.3

PMRA 1043784 Degradation of YRC 2894 by plant cell suspension cultures (supplemental study in support of metabolism in plants). Bayer Report No. 108287 (PF 4346). Study report date: 10-Mar-98. 44 pages. DACO 6.3

PMRA 1044174 An Analytical Method for the Determination of YRC 2894 Residues in Plant Matrices. Bayer Report Number 108450; Study Number: Y4121601. Study report date: 17-Mar-99. 74 pages. DACO 7.2.1

PMRA 1044182 Independent Laboratory Validation of Analytical Method 108450 for the Determination of Total Residues of YRC 2894 in Cotton and Cotton Processed Products. Bayer Report Number 108831; Study Number: Y4111601. Study report date: 15-Jan-99. 66 pages. DACO 7.2.3

PMRA 1044184 Radiovalidation of the YRC 2894 Total Residue Method for Cotton Seed and the Gin Trash. Bayer Report Number 108288 (PF 4297). Study report date: 11-Dec-97. 43 pages. DACO 7.2.3

PMRA 1044177 Residue Analytical Method for the Determination of YRC 2894 Residues in Plant Materials by HPLC. Bayer Report No. 00419. Study report date: 16-Jun-98. 55 pages. DACO 7.2.1

PMRA 1044179 Residue Analytical Method for the Determination of Residues of Imidacloprid, Hydro- Imidacloprid, Olefin-Imidacloprid, YRC 2894, YRC 2894-Amide and 4-Hydroxy-YRC 2894-Amide in Plant Material by HPLC with Electrospray MS/MS-Detection. Bayer Report No. 00573. Bayer Report No. 108908. Study report date:09-Mar-99. 117 pages. DACO 7.2.1

PMRA 1044180 An Analytical Method for the Determination of YRC 2894, Amide-YRC 2894, 4-Hydroxy YRC 2894 Amide Residues in Various Plant Matrices by LC-MS/MS. Bayer Report No. 110856. Study report date: 13-Jun-2003. 223 pages. DACO 7.2.1

PMRA1044185 Independent Laboratory Validation of "An Analytical for the Determination of YRC 2894, Amide-YRC 2894, 4-Hydroxy YRC 2894 Amide Residues in Various Plant Matrices by LC-MS/MS" According to PR Notice 96-1 and OPPTS 860.1340 Guidelines. Bayer Report No. 110329. Study report date: 15-Oct-2001. 110 pages. DACO 7.2.3

PMRA 1044176	Residue Analytical Method for the Determination of YRC 2894 Total Residues in Animal Material by GC-MSD. Bayer Report No. 00491. Study report date: 18-Jun-98. 182 pages. DACO 7.2.1
PMRA 1044183	Radiovalidation of the Animal Residue Method for YRC 2894. Bayer Study No. P61374502 (MR-411/98). Study report date: 18-Sep-98. 39 pages. DACO 7.2.3
PMRA 1044175	Residue Analytical Method for the Determination of YRC-2894 Residues in Animal Material by LC-MS/MS; Bayer Report No. 00490. Study report date: 13-May-98. 192 pages. DACO 7.2.1
PMRA 1044178	Independent Laboratory Validation of "Residue Analytical Method for the Determination of YRC-2894 Residues in Animal Material by LC-MS/MS" Laboratory: ABC Laboratories, Columbia, MO, ABC Labs Study 44685; Bayer Report: 108913. Study report date: 11-Sep-98. 259 pages. DACO 7.2.1
PMRA 1044186	Evaluation of YRC 2894 Through the FDA Multiresidue Methods. Bayer Report No. 108832. Study report date: 12-Jan-99. 66 pages. DACO 7.2.4
PMRA 1044187	Storage Stability of YRC 2894 Residues in Crops during Freezer Storage. Bayer Report No. 108520 (MR-1026/97). Study report date: 09-Dec-97.39 pages. DACO 7.3
PMRA 1044188	YRC 2894 480SC and 70WG - Magnitude of the Residue on Pome Fruit (Apple/Pear). Bayer Report No. 108812. Study report date: 11-Mar-99. 817 pages. DACO 7.4.1. Part 1 of 4
PMRA 1044189	YRC 2894 480SC and 70WG - Magnitude of the Residue on Pome Fruit (Apple/Pear). Bayer Report No. 108812. Study report date: 11-Mar-99. 817 pages. DACO 7.4.1. Part 2 of 4
PMRA 1044190	YRC 2894 480SC and 70WG - Magnitude of the Residue on Pome Fruit (Apple/Pear). Bayer Report No. 108812. Study report date: 11-Mar-99. 817 pages. DACO 7.4.1. Part 3 of 4
PMRA 1044191	YRC 2894 480SC and 70WG - Magnitude of the Residue on Pome Fruit (Apple/Pear). Bayer Report No. 108812. Study report date: 11-Mar-99. 817 pages. DACO 7.4.1. Part 4 of 4
PMRA 1178241	Calypso 480SC - Magnitude of the Residue in/on Pome Fruit. Report Number: 06BCS-03/04. Study report date: 29-Mar-2006. 1734 pages. DACO 7.4.1

PMRA 1044096 YRC 2984 480SC - Magnitude of the Residue in Apple Processed Commodities. Bayer Report No. 108813. Study report date: 11-Mar-99. 336 pages. DACO 7.4.5. Part 1 of 2

PMRA 1044097 YRC 2984 480SC - Magnitude of the Residue in Apple Processed Commodities. Bayer Report No. 108813. Study report date: 11-Mar-99. 336 pages. DACO 7.4.5. Part 2 of 2

PMRA 1241232 Determination of Residues of YRC 2498 SC Following Spray Application on Apple (Fruit, Pomace, Sauce, Fruit, washed, Fruit, dried) in the Federal Republic of Germany; Bayer Study Number 502758, Bayer Report Number RA-3062/95. Study report date: 06-Nov-97. 49 pages. DACO 7.4.5

PMRA 1241185 Determination of residues of YRC 2894 480 SC Following Spray Application on Apple (Fruit, Juice, Pomace, Sauce, Fruit washed, Fruit dried) in Italy; Bayer Study No 502707; Bayer Report No. RA-3063/95; Study report date: 12-Nov-97. 50 pages. DACO 7.4.5

PMRA 1043777 YRC 2894 - A 28-Day Dairy Cattle Feeding Study. Bayer Report No 108484 (Report MR-369/98); Study report date: 26-Jun-98. 1090 pages. DACO 7.5. Part 1 of 5

PMRA 1043778 YRC 2894 - A 28-Day Dairy Cattle Feeding Study. Bayer Report No 108484 (Report MR-369/98); Study report date: 26-Jun-98. 1090 pages. DACO 7.5. Part 2 of 5

PMRA 1043773 YRC 2894 - A 28-Day Dairy Cattle Feeding Study. Bayer Report No 108484 (Report MR-369/98); Study report date: 26-Jun-98. 1090 pages. DACO 7.5. Part 3 of 5

PMRA 1043774 YRC 2894 - A 28-Day Dairy Cattle Feeding Study. Bayer Report No 108484 (Report MR-369/98); Study report date: 26-Jun-98. 1090 pages. DACO 7.5. Part 4 of 5

PMRA 1043775 YRC 2894 - A 28-Day Dairy Cattle Feeding Study. Bayer Report No 108484 (Report MR-369/98); Study report date: 26-Jun-98. 1090 pages. DACO 7.5. Part 5 of 5

5.0 Environmental Assessment Division

5.1 Studies/Information Provided by the Applicant

PMRA 1043813 KKO 2254 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T2060033. Study report date: 01-December-1995. Bayer Report Number 24553. 33 pages. DACO 9.7.

PMRA 1043814 YRC 2894 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T3059270. Study report date: 26-August-1996. Bayer Report Number 108854. 41 pages. DACO 9.7.

PMRA 1043815 WAK 6999 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T8060110. Study report date: 02-February-1996. Bayer Report Number 108860. 29 pages. DACO 9.7.

PMRA 1043817 YRC 2894 Acute oral toxicity study in mice. Nihon Bayer Agrochem K.K., Research & Development Division, Yuki Research Center. Laboratory Study Number 97219. Study report date: 6-March-1998. Bayer Report Number 109285. 27 pages. DACO 9.7.

PMRA 1043919 Hydrolysis of YRC 2894 in sterile aqueous buffer solutions. Bayer AG Crop Protection Development. Laboratory Study Number M 111 0678-4. Study report date: 16-February-1998. Bayer Report Number 108257. 40 pages. DACO 8.2.3.2.

PMRA 1043920 Photolysis of YRC 2894 on soil surface. Bayer AG Crop Protection Development. Laboratory Study Number M 113 0672-0. Study report date: 26-February-1998. Bayer Report Number 108308. 61 pages. DACO 8.2.3.3.1.

PMRA 1043921 Photolysis of YRC 2894 in aqueous buffer solution. Bayer AG Crop Protection Development. Laboratory Study Number M 112 0677-4. Study report date: 18-February-1998. Bayer Report Number 108262. 57 pages. DACO 8.2.3.3.2.

PMRA 1043923 Calculation of DT50 values of YRC 2894 metabolite KKO 2254 in soil under aerobic conditions. Bayer AG Crop Protection Development. Study report date: 2-March-1998. Bayer Report Number 108300. 17 pages. DACO 8.2.3.4.2.

PMRA 1043924 Degradation of [methylene-14C]WAK 6999 in three soils. Bayer AG Crop Protection Development. Laboratory Study Number M 1250746-5. Study report date: 11-February-1998. Bayer Report Number 108253. 57 pages. DACO 8.2.3.4.2.

PMRA 1043925 Degradation and metabolism of [14C]YRC 2894 in soils under aerobic conditions. Bayer AG Crop Protection Development. Laboratory Study Number M 1250625-1. Study report date: 9-February-1998. Bayer Report Number 108254. 101 pages. DACO 8.2.3.4.2.

PMRA 1043927 Aerobic aquatic degradation and metabolism of YRC 2894 in the water-sediment system. Bayer AG Crop Protection Development. Laboratory Study Number M 151 0707-1. Study report date: 9-December-1997. Bayer Report Number 108280. 79 pages. DACO 8.2.3.5.4.

PMRA 1043928 Anaerobic aquatic metabolism of the active ingredient YRC 2894. Bayer AG Crop Protection Development. Laboratory Study Number M 152 0654-3. Study report date: 23-March-1998. Bayer Report Number 108319. 95 pages. DACO 8.2.3.5.6.

PMRA 1043929 Adsorption/desorption of WAK 6999 on different soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0765-3. Study report date: 17-February-1998. Bayer Report Number 108252. 46 pages. DACO 8.2.4.2.

PMRA 1043930 Adsorption/desorption of YRC 2894 on soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0610-2. Study report date: 9-June-1994. Bayer Report Number 106695. 42 pages. DACO 8.2.4.2.

PMRA 1043931 Adsorption/desorption of KKO 2254 on soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0704-6. Study report date: 26-June-1995. Bayer Report Number 107932. 46 pages. DACO 8.2.4.2.

PMRA 1043932 Leaching behaviour of the pesticidal active ingredient YRC 2894 after prior aging in soil (aged leaching) according to EPA requirements. Bayer AG Crop Protection Development. Laboratory Study Number M 121 0692-1. Study report date: 14-November-1995. Bayer Report Number 107936. 50 pages. DACO 8.2.4.3.2.

PMRA 1043933 Leaching behaviour of the crop protection compound YRC 2894 with previous aging in soil. Bayer AG Crop Protection Development. Laboratory Study Number M 121 0608-8. Study report date: 31-October-1995. Bayer Report Number 108307. 29 pages. DACO 8.2.4.3.2.

PMRA 1043962 Tier 1 Seedling emergence nontarget phytotoxicity study using YRC 2894 480 SC. Bayer Corporation Agriculture Division. Laboratory Study Number Y4201603. Study report date: 10-March-1999. Bayer Report Number 108837. 82 pages. DACO 9.8.6.

PMRA 1043963 Tier 1 Vegetative vigor nontarget phytotoxicity study using YRC 2894 480 SC. Bayer Corporation Agriculture Division. Laboratory Study Number Y4201604. Study report date: 10-March-1999. Bayer Report Number 108838. 71 pages. DACO 9.8.6.

PMRA 1043966 YRC 2894 - Toxicity (15 days) to *Lemna gibba* G3. Bayer AG Crop Protection Development. Laboratory Study Number E 4121011-0. Study report date: 6-March-1996. Bayer Report Number 108101. 43 pages. DACO 9.8.5.

PMRA 1043967 Acute toxicity of YRC 2894 to *Hyalella azteca* under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4823201. Study report date: 24-June-1996. Bayer Report Number 107336. 34 pages. DACO 9.9.

PMRA 1043968 Acute toxicity of KKO 2254 to *Hyalella azteca* under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4883201. Study report date: 18-June-1997. Bayer Report Number 107719. 31 pages. DACO 9.9.

PMRA 1044036 Toxicity of YRC 2894 (tech.) to earthworms. Bayer AG Crop Protection. Laboratory Study Number E 310 0900-3. Study report date: 28-November-1998. Bayer Report Number 108469. 17 pages. DACO 9.2.3.1.

PMRA 1044037 Acute toxicity of YRC 2894 SC 480 to earthworms. Bayer AG Crop Protection. Laboratory Study Number E 310 0940-7. Study report date: 4-July-1995. Bayer Report Number HBF/Rg 214. 14 pages. DACO 9.2.8.

PMRA 1044040 Testing toxicity to honeybee - *Apis mellifera* L. (laboratory) according to EPPO guideline No. 170 (1992) YRC 2894 SC 480. BioChem agrar. Laboratory Study Number 97 10 48 005. Study report date: 19-December-1997. Bayer Report Number 108747. 32 pages. DACO 9.2.8.

PMRA 1044041 Assessment of side effects of YRC 2894 (tech.) to the honey bee, *Apis mellifera* L. in the laboratory following the EPPO guideline No. 170. Arbeitsgemeinschaft GAB Biotechnologie GmbH and IFU Umweltanalytik GmbH. Laboratory Study Number 95087/01-BLEU. Study report date: 13-October-1995. Bayer Report Number 108746. 25 pages. DACO 9.2.4.1-9.2.4.2.

PMRA 1044043 Acute toxicity of YRC 2894-sulfonic acid to water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 320 1012-9. Study report date: 16-February-1995. Bayer Report Number 108479. 48 pages. DACO 9.3.2.

PMRA 1044044 Acute toxicity of YRC 2894 (tech.) to water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 320 0935-2. Study report date: 16-May-1995. Bayer Report Number 108485. 44 pages. DACO 9.3.2.

PMRA 1044045 Influence of YRC 2894 (techn.) on the reproduction rate of water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 321 0944-3. Study report date: 23-July-1996. Bayer Report Number 107358. 86 pages. DACO 9.3.3.

PMRA 1044047 Influence of KKO 2254 on development and emergence of larvae of *Chironomus riparius* in a water-sediment system. Bayer AG Crop Protection Development. Laboratory Study Number E 416 1064-2. Study report date: 26-February-1997. Bayer Report Number HBF/Ch 12. 37 pages. DACO 9.3.4.

PMRA 1044048 Influence of YRC 2894 SC 480 on development and emergence of larvae of *Chironomus riparius* in a water-sediment system in regard to the time between application and inserting of larvae. Bayer AG Crop Protection Development. Laboratory Study Number E 322 1240-4. Study report date: 29-May-1998. Bayer Report Number HBF/Ch 23. 43 pages. DACO 9.3.5.

PMRA 1044049 YRC 2894: A 96-hour flow-through acute toxicity test with the saltwater mysid (*Mysidopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-102. Study report date: 14-November-1996. Bayer Report Number 107353. 53 pages. DACO 9.4.2.

PMRA 1044050 YRC 2894 480 SC: A 96-hour flow-through acute toxicity test with the saltwater mysid (*Mysidopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-104. Study report date: 18-August-1997. Bayer Report Number 107824. 46 pages. DACO 9.4.2.

PMRA 1044051 YRC 2894: A 96-hour shell deposition test with the eastern oyster (*Crassostrea virginica*). Wildlife International Ltd. Laboratory Study Number 149A-101. Study report date: 14-November-1996. Bayer Report Number 107362. 53 pages. DACO 9.4.4.

PMRA 1044052 YRC 2894: A flow-through life-cycle toxicity test with the saltwater mysid (*Mysisdopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-103. Study report date: 14-November-1996. Bayer Report Number 107363. 68 pages. DACO 9.4.4.

PMRA 1044054 Acute toxicity of KKO 2254 to the rainbow trout (*Oncorhynchus mykiss*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4812201. Study report date: 16-December-1997. Bayer Report Number 107943. 29 pages. DACO 9.5.2.1.

PMRA 1044055 YRC 2894 technical - Acute toxicity (96 hours) to rainbow trout (*Oncorhynchus mykiss*) in a static test. Bayer Corporation Agriculture Division. Laboratory Study Number E 2500923-1. Study report date: 11-April-1995. Bayer Report Number 108474. 49 pages. DACO 9.5.2.1.

PMRA 1044056 YRC 2894-sulfonic acid - Acute toxicity (96 hours) to rainbow trout (*Oncorhynchus mykiss*) in a static test. Bayer AG Crop Protection Development. Laboratory Study Number E 2800992-0. Study report date: 26-September-1995. Bayer Report Number 108475. 42 pages. DACO 9.5.2.1.

PMRA 1044057 Acute toxicity of KKO 2254 to the bluegill (*Lepomis macrochirus*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4810301. Study report date: 30-June-1997. Bayer Report Number 107746. 29 pages. DACO 9.5.2.2.

PMRA 1044058 YRC 2894 technical - Acute toxicity (96 hours) to bluegill (*Lepomis macrochirus*) in a static test. Bayer Corporation Agriculture Division. Laboratory Study Number E2520924-4. Study report date: 22-September-1995. Bayer Report Number 108473. 47 pages. DACO 9.5.2.2.

PMRA 1044059 YRC 2894 SC 480 - Acute toxicity (96 hours) to bluegill (*Lepomis macrochirus*) in a static test. Bayer AG Crop Protection Development. Laboratory Study Number E2520989-5. Study report date: 5-October-1995. Bayer Report Number 108478. 47 pages. DACO 9.5.2.2.

PMRA 1044060 Acute toxicity of YRC 2894 to the sheepshead minnow (*Cyprinodon variegatus*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4832801. Study report date: 30-January-1998. Bayer Report Number 107907. 30 pages. DACO 9.5.2.3.

PMRA 1044061 Acute toxicity of YRC 2894 technical to the fathead minnow (*Pimephales promelas*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4811201. Study report date: 12-October-1998. Bayer Report Number 108490. 29 pages. DACO 9.5.2.3.

PMRA 1044062 YRC 2894 technical - Early life stage toxicity to rainbow trout (*Oncorhynchus mykiss*) under flow-through conditions. Bayer AG Crop Protection Development. Laboratory Study Number E 2840922-7. Study report date: 5-August-1997. Bayer Report Number 108476. 93 pages. DACO 9.5.2.1.

PMRA 1044063. YRC 2894 - Early life stage toxicity test with fathead minnow (*Pimephales promelas*). Springborn Laboratories Inc. Laboratory Study Number 13507.6126. Study report date: 01-June-1999. Bayer Report Number 109106. 72 pages. DACO 9.5.3.1.

PMRA 1044065/1044066 The chronic toxicity to the fathead minnow (*Pimephales promelas*) during a full life-cycle exposure. Springborn Laboratories Inc. Laboratory Study Number 13507.0598.6122.122. Study report date: 2-June-1999. Bayer Report Number 109109. 522 pages. DACO 9.5.3.2.

PMRA 1044067 YRC 2894 techn. Acute oral toxicity to bobwhite quail. Bayer AG Crop Protection Development. Laboratory Study Number E290856-2. Study report date: 7-September-1995. Bayer Report Number 108833. 39 pages. DACO 9.6.2.1.

PMRA 1044068 YRC 2894 techn. 5-Day-dietary LC_{50} to bobwhite quail. Bayer AG Crop Protection Development. Laboratory Study Number E2950857-6. Study report date: 8-September-1995. Bayer Report Number 108834. 32 pages. DACO 9.6.2.4.

PMRA 1044069 Five day dietary toxicity of YRC 2894 on mallard ducklings (*Anas platyrhynchos*). Bayer AG Agriculture Centre. Laboratory Study Number E 297 0933-3. Study report date: 2-February-1998. Bayer Report Number 108835. 35 pages. DACO 9.6.2.5.

PMRA 1044071 Effects of a subchronic dietary exposure of YRC 2894 on bobwhite quail including effects on reproduction and health. Bayer AG Agriculture Centre. Laboratory Study Number E 298 0891-7. Study report date: 4-August-1997. Bayer Report Number 108836. 163 pages. DACO 9.6.3.1.

PMRA 1044072 Effect of technical YRC 2894 on mallard reproduction. Bayer Corporation Agriculture Division. Laboratory Study Number Y4740801. Study report date: 18-December-1997. Bayer Report Number 107360. 106 pages. DACO 9.6.3.2.

PMRA 1044074 Influence of YRC 2894 technical on the growth of the green alga, *Selenastrum capricornutum*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230927-6. Study report date: 3-July-1995. Bayer Report Number 108477. 46 pages. DACO 9.8.2.

PMRA 1044075 Influence of YRC 2894-sulfonic acid on the growth of the green alga, *Scenedesmus subspicatus*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230980-5. Study report date: 27-February-1996. Bayer Report Number 108480. 24 pages. DACO 9.8.2.

PMRA 1044076 Influence of YRC 2894 on the growth of the green alga, *Scenedesmus subspicatus*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230973-7. Study report date: 30-August-1995. Bayer Report Number 108481. 19 pages. DACO 9.8.2.

PMRA 1044119 Terrestrial field dissipation of YRC 2894 in Wisconsin soil, 1995. Agstat, A&L Great Lakes Laboratories Inc. and Bayer Corporation. Laboratory Study Number Y4022102. Study report date: 14-January-1999. Bayer Report Number 107900. 190 pages. DACO 8.3.2.

PMRA 1044120 Terrestrial field dissipation of YRC 2894 in Georgia soil, 1996. Bayer Research Farm, Bayer Research Park and A&L Great Lakes Laboratories Inc. Laboratory Study Number Y4022101. Study report date: 8-February-1999. Bayer Report Number 108146. 203 pages. DACO 8.3.2.

PMRA 1044121 Dissipation of YRC 2894 (480 SC) in soil under field conditions (France and Spain). Bayer AG Crop Protection Development. Study Numbers R502898 and R502928. Study report date: 22-January-1998. Bayer Report Number 108301. 83 pages. DACO 8.3.2.

PMRA 1044122 Dissipation of YRC 2894 (480 SC) in soil under field conditions (France, Germany, Great Britain). Bayer AG Crop Protection Development. Study Numbers R502855, R502863, R502871, R505633, R505641 and R505668. Study report date: 14-November-1997. Bayer Report Number 108302. 149 pages. DACO 8.3.2.

PMRA 1044123 Terrestrial field dissipation of YRC 2894 in California soil, 1995. Bayer Research Farm and Bayer Research Park. Laboratory Study Number Y4022103. Study report date: 25-January-1999. Bayer Report Number 107901. 186 pages. DACO 8.3.2.

PMRA 1044148 YRC 2894 480 SC 05776/0071 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T8061849. Study report date: 19-March-1998. Bayer Report Number 108668. 32 pages. DACO 9.7.

PMRA 1241509 Testing toxicity to beneficial arthropods Green lacewing - *Chrysopa carnea* STEPH. (extended laboratory test) following the proposal of semifield method (Bock 1992) and the IOBC Guideline (Bigler & Waldburger 1988) - YRC 2894 SC 480. BioChem agrar. Laboratory Study Number 97 10 48 007. Study report date: 18-December-1997. Bayer Report Number not available. 15 pages. DACO 9.2.5.

PMRA 1278935 Foliar half-life for use in the terrestrial vertebrate exposure assessment for thiacloprid. Bayer CropScience. Laboratory Study Number: not applicable. Study report date: 29-June-2006. Bayer Report Number 201542. 16 pages. DACO 8.6.

5.2 Additional Information

5.2.1 Published Information

None.

5.2.2 Unpublished information

PMRA 1043798 USEPA. Data Evaluation Record (MRID number not available) on acute oral toxicity testing. Study title: WAK 6999 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T8060110. Study report date: 02-February-1996. Bayer Report Number 108860. DACO 9.7. DER completion date: not available. 2 pages.

PMRA 1043799 USEPA. Data Evaluation Record (MRID number not available) on acute oral toxicity testing. Study title: KKO 2254 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T2060033. Study report date: 01-December-1995. Bayer Report Number 24553. DACO 9.7. DER completion date: not available. 3 pages.

PMRA 1043800 USEPA. Data Evaluation Record (MRID number not available) on acute oral toxicity testing. Study title: YRC 2894 Acute oral toxicity study in mice. Nihon Bayer Agrochem K.K., Research & Development Division, Yuki Research Center. Laboratory Study Number 97219. Study report date: 6-March-1998. Bayer Report Number 109285. DACO 9.7. DER completion date: not available. 3 pages.

PMRA 1043949 USEPA. Data Evaluation Record (MRID number 44927804) on the acute LC_{50} test with a freshwater invertebrate. Study title: Acute toxicity of YRC 2894 to *Hyalella azteca* under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4823201. Study report date: 24-June-1996. Bayer Report Number 107336. DACO 9.9. DER completion date: 15-January-2002. 12 pages.

PMRA 1043950 USEPA. Data Evaluation Record (MRID number 44927811) on the acute toxicity of KKO 2254 (YRC 2894 metabolite) to freshwater invertebrates - *Hyalella azteca*. Study title: Acute toxicity of KKO 2254 to *Hyalella azteca* under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4883201. Study report date: 18-June-1997. Bayer Report Number 107719. DACO 9.9. DER completion date: 23-January-2002. 13 pages.

PMRA 1043969 USEPA. Data Evaluation Record (MRID number 45159306) on honey bee - acute contact & oral LD_{50} test. Study title: Testing toxicity to honeybee - *Apis mellifera* L. (laboratory) according to EPPO guideline No. 170 (1992) YRC 2894 SC 480. BioChem agrar. Laboratory Study Number 97 10 48 005. Study report date: 19-December-1997. Bayer Report Number 108747. DACO 9.2.8. DER completion date: 3-December-2001. 15 pages.

PMRA 1043972 USEPA. Data Evaluation Record (MRID number 45159306) on honey bee - acute contact & oral LD_{50} test. Study title: Assessment of side effects of YRC 2894 (tech.) to the honey bee, *Apis mellifera* L. in the laboratory following the EPPO guideline No. 170. Arbeitsgemeinschaft GAB Biotechnologie GmbH and IFU Umweltanalytik GmbH. Laboratory Study Number 95087/01-BLEU. Study report date: 13-October-1995. Bayer Report Number 108746. DACO 9.2.4.1-9.2.4.2. DER completion date: 3-December-2001. 12 pages.

PMRA 1043973 USEPA. Data Evaluation Record (MRID number 44927832) on the acute toxicity of YRC 2894-sulfonic acid to freshwater invertebrates - *Daphnia magna*. Study title: Acute toxicity of YRC 2894-sulfonic acid to water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 320 1012-9. Study report date: 16-February-1995. Bayer Report Number 108479. DACO 9.3.2. DER completion date: 23-January-2002. 11 pages.

PMRA 1043974 USEPA. Data Evaluation Record (MRID number 44927835) on the acute toxicity of YRC 2894 technical to freshwater invertebrates - *Daphnia magna*. Study title: Acute toxicity of YRC 2894 (tech.) to water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 320 0935-2. Study report date: 16-May-1995. Bayer Report Number 108485. DACO 9.3.2. DER completion date: 23-January-2002. 13 pages.

PMRA 1043975 USEPA. Data Evaluation Record (MRID number 44927806) on the chronic toxicity of YRC 2894 (thiacloprid) to freshwater invertebrates - Daphnia sp. Study title: Influence of YRC 2894 (techn.) on the reproduction rate of water fleas (*Daphnia magna*). Bayer AG Crop Protection Development. Laboratory Study Number E 321 0944-3. Study report date: 23-July-1996. Bayer Report Number 107358. DACO 9.3.3. DER completion date: 23-January-2002. 21 pages.

PMRA 1043977 USEPA. Data Evaluation Record (MRID number 44927823) on the midge chronic toxicity study. Study title: Influence of KKO 2254 on development and emergence of larvae of *Chironomus riparius* in a water-sediment system. Bayer AG Crop Protection Development. Laboratory Study Number E 416 1064-2. Study report date: 26-February-1997. Bayer Report Number HBF/Ch 12. DACO 9.3.4. DER completion date: 15-January-2002. 14 pages.

PMRA 1043978 USEPA. Data Evaluation Record (MRID number not available) on fish life-cycle toxicity test. Study title: The chronic toxicity to the fathead minnow (*Pimephales promelas*) during a full life-cycle exposure. Springborn Laboratories Inc. Laboratory Study Number 13507.0598.6122.122. Study report date: 2-June-1999. Bayer Report Number 109109. DACO 9.5.3.2. DER completion date: not available. 33 pages.

PMRA 1043979 USEPA. Data Evaluation Record (MRID number 44927841) on the acute oral toxicity of YRC 2894 to avian species (*Colinus virginianus*). Study title: YRC 2894 techn. Acute oral toxicity to bobwhite quail. Bayer AG Crop Protection Development. Study Number E290856-2. Study report date: 7-September-1995. Bayer Report Number 108833. DACO 9.6.2.1. DER completion date: 7-December-2001. 15 pages.

PMRA 1043980 USEPA. Data Evaluation Record (MRID number 44927842) on the acute dietary toxicity of YRC 2894 technical to avian species, bobwhite quail. Study title: YRC 2894 techn. 5-Day-dietary LC_{50} to bobwhite quail. Bayer AG Crop Protection Development. Study Number E2950857-6. Study report date: 8-September-1995. Bayer Report Number 108834. DACO 9.6.2.4. DER completion date: 7-December-2001. 14 pages.

PMRA 1043981 USEPA. Data Evaluation Record (MRID number 44927843) on the acute dietary toxicity of YRC 2894 to avian species, *Anas platyrhynchos*. Study title: Five day dietary toxicity of YRC 2894 on mallard ducklings (*Anas platyrhynchos*). Bayer AG Agriculture Centre. Laboratory Study Number E 297 0933-3. Study report date: 2-February-1998. Bayer Report Number 108835. DACO 9.6.2.5. DER completion date: 7-December-2001. 10 pages.

PMRA 1043983 USEPA. Data Evaluation Record (MRID number 44927844) on the reproductive effects of YRC 2894 technical on avian species *Colinus virginianus*. Study title: Effects of a subchronic dietary exposure of YRC 2894 on bobwhite quail including effects on reproduction and health. Bayer AG Agriculture Centre. Study Number E 298 0891-7. Study report date: 4-August-1997. Bayer Report Number 108836. DACO 9.6.3.1. DER completion date: 20-December-2001. 155 pages.

PMRA 1043984 USEPA. Data Evaluation Record (MRID number 44927807) on the reproductive effects of YRC 2894 technical on avian species *Anas platyrhynchos*. Study title: Effect of technical YRC 2894 on mallard reproduction. Bayer Corporation Agriculture Division. Laboratory Study Number Y4740801. Study report date: 18-December-1997. Bayer Report Number 107360. DACO 9.6.3.2. DER completion date: 20-December-2001. 152 pages.

PMRA 1043986 USEPA. Data Evaluation Record (MRID number 44927830) on the acute toxicity of thiacloprid to algae *Selenastrum capricornutum*. Study title: Influence of YRC 2894 technical on the growth of the green alga, *Selenastrum capricornutum*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230927-6. Study report date: 3-July-1995. Bayer Report Number 108477. DACO 9.8.2. DER completion date: 3-December-2001. 17 pages.

PMRA 1043987 USEPA. Data Evaluation Record (MRID number 44927833) on the acute toxicity of YRC 2894 sulfonic acid to algae *Scenedesmus subspicatus*. Study title: Influence of YRC 2894-sulfonic acid on the growth of the green alga, *Scenedesmus subspicatus*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230980-5. Study report date: 27-February-1996. Bayer Report Number 108480. DACO 9.8.2. DER completion date: 3-December-2001. 13 pages.

PMRA 1043988 USEPA. Data Evaluation Record (MRID number 44927834) on the acute toxicity of YRC 2894 to algae *Scenedesmus subspicatus*. Study title: Influence of YRC 2894 on the growth of the green alga, *Scenedesmus subspicatus*. Bayer AG Crop Protection Development. Laboratory Study Number E 3230973-7. Study report date: 30-August-1995. Bayer Report Number 108481. DACO 9.8.2. DER completion date: 3-December-2001. 15 pages.

PMRA 1043991 USEPA. Data Evaluation Record (MRID number 44927845) on seedling emergence EC_{25} test (tier 1). Study title: Tier 1 Seedling emergence nontarget phytotoxicity study using YRC 2894 480 SC. Bayer Corporation Agriculture Division. Laboratory Study Number Y4201603. Study report date: 10-March-1999. Bayer Report Number 108837. DACO 9.8.6. DER completion date: 3-December-2001. 9 pages.

PMRA 1043992 USEPA. Data Evaluation Record (MRID number 44927901) on vegetative vigor EC_{25} test (tier 1). Study title: Tier 1 Vegetative vigor nontarget phytotoxicity study using YRC 2894 480 SC. Bayer Corporation Agriculture Division. Laboratory Study Number Y4201604. Study report date: 10-March-1999. Bayer Report Number 108838. DACO 9.8.6. DER completion date: 3-December-2001. 8 pages.

PMRA 1043993 USEPA. Data Evaluation Record (MRID number 44927817) on the acute toxicity of thiacloprid to aquatic vascular plants *Lemna gibba*. Study title: YRC 2894 - Toxicity (15 days) to *Lemna gibba* G3. Bayer AG Crop Protection Development. Laboratory Study Number E 4121011-0. Study report date: 6-March-1996. Bayer Report Number 108101. DACO 9.8.5. DER completion date: 3-December-2001. 13 pages.

PMRA 1043995 USEPA. Data Evaluation Record (MRID number 44927805) on the acute LC$_{50}$ test with an estuarine/marine organism. Study title: YRC 2894: A 96-hour flow-through acute toxicity test with the saltwater mysid (*Mysidopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-102. Study report date: 14-November-1996. Bayer Report Number 107353. DACO 9.4.2. DER completion date: 15-January-2001. 13 pages.

PMRA 1043996 USEPA. Data Evaluation Record (MRID number 44927814) on the acute LC$_{50}$ test with an estuarine/marine organism. Study title: YRC 2894 480 SC: A 96-hour flow-through acute toxicity test with the saltwater mysid (*Mysidopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-104. Study report date: 18-August-1997. Bayer Report Number 107824. DACO 9.4.2. DER completion date: 2-March-2003. 12 pages.

PMRA 1043997 USEPA. Data Evaluation Record (MRID number 44927808) on the acute EC$_{50}$ test with an estuarine/marine mollusk - shell deposition study. Study title: YRC 2894: A 96-hour shell deposition test with the eastern oyster (*Crassostrea virginica*). Wildlife International Ltd. Laboratory Study Number 149A-101. Study report date: 14-November-1996. Bayer Report Number 107362. DACO 9.4.4. DER completion date: 15-January-2002. 12 pages.

PMRA 1043998 USEPA. Data Evaluation Record (MRID number 44927809) on the aquatic invertebrate life cycle test. Study title: YRC 2894: A flow-through life-cycle toxicity test with the saltwater mysid (*Mysisdopsis bahia*). Wildlife International Ltd. Laboratory Study Number 149A-103. Study report date: 14-November-1996. Bayer Report Number 107363. DACO 9.4.4. DER completion date: 15-January-2002. 19 pages.

PMRA 1043999 USEPA. Data Evaluation Record (MRID number 44927816) on the acute toxicity of KKO 2254, a metabolite of thiacloprid, to rainbow trout (*Oncorhynchus mykiss*). Study title: Acute toxicity of KKO 2254 to the rainbow trout (*Oncorhynchus mykiss*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4812201. Study report date: 16-December-1997. Bayer Report Number 107943. DACO 9.5.2.1. DER completion date: 7-December-2001. 14 pages.

PMRA 1044000 USEPA. Data Evaluation Record (MRID number 44927827) on the acute toxicity of YRC 2894 to rainbow trout (*Oncorhynchus mykiss*). Study title: YRC 2894 technical - Acute toxicity (96 hours) to rainbow trout (*Oncorhynchus mykiss*) in a static test. Bayer Corporation Agriculture Division. Laboratory Study Number E 2500923-1. Study report date: 11-April-1995. Bayer Report Number 108474. DACO 9.5.2.1. DER completion date: 7-December-2001. 15 pages.

PMRA 1044001 USEPA. Data Evaluation Record (MRID number 44927828) on the acute toxicity of YRC 2894-sulfonic acid (WAK 6999), a derivative of thiacloprid, to rainbow trout (*Oncorhynchus mykiss*). Study title: YRC 2894-sulfonic acid - Acute toxicity (96 hours) to rainbow trout (*Oncorhynchus mykiss*) in a static test. Bayer AG Crop Protection Development. Laboratory Study Number E 2800992-0. Study report date: 26-September-1995. Bayer Report Number 108475. DACO 9.5.2.1. DER completion date: 7-December-2001. 14 pages.

PMRA 1044002 USEPA. Data Evaluation Record (MRID number 44927813) on the acute toxicity KKO 2254, a metabolite of thiacloprid, to bluegill (*Lepomis macrochirus*). Study title: Acute toxicity of KKO 2254 to the bluegill (*Lepomis macrochirus*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number K4810301. Study report date: 30-June-1997. Bayer Report Number 107746. DACO 9.5.2.2. DER completion date: 7-December-2001. 13 pages.

PMRA 1044003 USEPA. Data Evaluation Record (MRID number 44927826) on the acute toxicity of YRC 2894 to bluegill (*Lepomis macrochirus*). Study title: YRC 2894 technical - Acute toxicity (96 hours) to bluegill (*Lepomis macrochirus*) in a static test. Bayer Corporation Agriculture Division. Laboratory Study Number E2520924-4. Study report date: 22-September-1995. Bayer Report Number 108473. DACO 9.5.2.2. DER completion date: 7-December-2001. 17 pages.

PMRA 1044004 USEPA. Data Evaluation Record (MRID number 44927831) on the acute toxicity of YRC 2894 SC 480, a formulation of thiacloprid, to bluegill (*Lepomis macrochirus*). Study title: YRC 2894 SC 480 - Acute toxicity (96 hours) to bluegill (*Lepomis macrochirus*) in a static test. Bayer AG Crop Protection Development. Laboratory Study Number E2520989-5. Study report date: 5-October-1995. Bayer Report Number 108478. DACO 9.5.2.2. DER completion date: 20-December-2001. 16 pages.

PMRA 1044005 USEPA. Data Evaluation Record (MRID number 44927815) on the acute toxicity of YRC 2894 to sheepshead minnow (*Cyprinodon variegatus*). Study title: Acute toxicity of YRC 2894 to the sheepshead minnow (*Cyprinodon variegatus*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4832801. Study report date: 30-January-1998. Bayer Report Number 107907. DACO 9.5.2.3. DER completion date: 20-December-2001. 15 pages.

PMRA 1044006 USEPA. Data Evaluation Record (MRID number 44927838) on the acute toxicity of YRC 2894 to fathead minnow (*Pimephales promelas*). Study title: Acute toxicity of YRC 2894 technical to the fathead minnow (*Pimephales promelas*) under static conditions. Bayer Corporation Agriculture Division. Laboratory Study Number Y4811201. Study report date: 12-October-1998. Bayer Report Number 108490. DACO 9.5.2.3. DER completion date: 7-December-2001. 15 pages.

PMRA 1044007 USEPA. Data Evaluation Record (MRID number 44927829) on the toxicity of YRC 2894 technical to rainbow trout (*Oncorhynchus mykiss*), early life stage. Study title: YRC 2894 technical - Early life stage toxicity to rainbow trout (*Oncorhynchus mykiss*) under flow-through conditions. Bayer AG Crop Protection Development. Laboratory Study Number E 2840922-7. Study report date: 5-August-1997. Bayer Report Number 108476. DACO 9.5.2.1. DER completion date: 20-December-2001. 33 pages.

PMRA 1044008 USEPA. Data Evaluation Record (MRID number 44927903) on the toxicity of YRC 2894 technical to the early life stage of fathead minnow (*Pimephales promelas*). Study title: YRC 2894 - Early life stage toxicity test with fathead minnow (*Pimephales promelas*). Springborn Laboratories Inc. Laboratory Study Number 13507.6126. Study report date: 01-June-1999. Bayer Report Number 109106. DACO 9.5.3.1. DER completion date: 15-January-2002. 21 pages.

PMRA 1044009 USEPA. Data Evaluation Record (MRID number 44927917) on the hydrolysis of thiacloprid. Study title: Hydrolysis of YRC 2894 in sterile aqueous buffer solutions. Bayer AG Crop Protection Development. Laboratory Study Number M 111 0678-4. Study report date: 16-February-1998. Bayer Report Number 108257. DACO 8.2.3.2. DER completion date: not available. 11 pages.

PMRA 1044010 USEPA. Data Evaluation Record (MRID number 44927933) on the phototransformation of thiacloprid on soil. Study title: Photolysis of YRC 2894 on soil surface. Bayer AG Crop Protection Development. Laboratory Study Number M 113 0672-0. Study report date: 26-February-1998. Bayer Report Number 108308. DACO 8.2.3.3.1. DER completion date: not available. 20 pages.

PMRA 1044020 USEPA. Data Evaluation Record (MRID number 44927918) on the phototransformation of thiacloprid in water. Study title: Photolysis of YRC 2894 in aqueous buffer solution. Bayer AG Crop Protection Development. Laboratory Study Number M 112 0677-4. Study report date: 18-February-1998. Bayer Report Number 108262. DACO 8.2.3.3.2. DER completion date: not available. 14 pages.

PMRA 1044022 USEPA. Data Evaluation Record (MRID number 44927915) on the aerobic biotransformation of thiacloprid metabolite WAK 6999 (as sodium salt) in soil. Study title: Degradation of [methylene-14C]WAK 6999 in three soils. Bayer AG Crop Protection Development. Laboratory Study Number M 1250746-5. Study report date: 11-February-1998. Bayer Report Number 108253. DACO 8.2.3.4.2. DER completion date: not available. 18 pages.

PMRA 1044023 USEPA. Data Evaluation Record (MRID number 44927916/44927929) on the aerobic biotransformation of thiacloprid in soil. Studies title: 1) Degradation and metabolism of [14C]YRC 2894 in soils under aerobic conditions. Bayer AG Crop Protection Development. Laboratory Study Number M 1250625-1. Study report date: 9-February-1998. Bayer Report Number 108254; and 2) Calculation of DT50 values of YRC 2894 metabolite KKO 2254 in soil under aerobic conditions. Bayer AG Crop Protection Development. Study report date: 2-March-1998. Bayer Report Number 108300. DACO 8.2.3.4.2. DER completion date: not available. 24 pages.

PMRA 1044026 USEPA. Data Evaluation Record (MRID number 44927920) on the aerobic biotransformation of thiacloprid (YRC 2894) in water-sediment system. Study title: Aerobic aquatic degradation and metabolism of YRC 2894 in the water-sediment system. Bayer AG Crop Protection Development. Laboratory Study Number M 151 0707-1. Study report date: 9-December-1997. Bayer Report Number 108280. DACO 8.2.3.5.4. DER completion date: not available. 23 pages.

PMRA 1044027 USEPA. Data Evaluation Record (MRID number 44927935) on the anaerobic biotransformation of thiacloprid in water-sediment system. Study title: Anaerobic aquatic metabolism of the active ingredient YRC 2894. Bayer AG Crop Protection Development. Laboratory Study Number M 152 0654-3. Study report date: 23-March-1998. Bayer Report Number 108319. DACO 8.2.3.5.6. DER completion date: not available. 32 pages.

PMRA 1044028 USEPA. Data Evaluation Record (MRID number 44927905) on the adsorption-desorption of thiacloprid in soil. Study title: Adsorption/desorption of YRC 2894 on soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0610-2. Study report date: 9-June-1994. Bayer Report Number 106695. DACO 8.2.4.2. DER completion date: not available. 30 pages.

PMRA 1044029 USEPA. Data Evaluation Record (MRID number 44927914) on the adsorption-desorption of thiacloprid degradate WAK 6999 in soil. Study title: Adsorption/desorption of WAK 6999 on different soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0765-3. Study report date: 17-February-1998. Bayer Report Number 108252. DACO 8.2.4.2. DER completion date: not available. 24 pages.

PMRA 1044030 USEPA. Data Evaluation Record (MRID number 44927909) on the adsorption-desorption of thiacloprid degradate KKO 2254 in soil. Study title: Adsorption/desorption of KKO 2254 on soils. Bayer AG Crop Protection Development. Laboratory Study Number M 131 0704-6. Study report date: 26-June-1995. Bayer Report Number 107932. DACO 8.2.4.2. DER completion date: not available. 25 pages.

PMRA 1044031 USEPA. Data Evaluation Record (MRID number 44927909) on the leaching of thiacloprid in soil. Study title: Leaching behaviour of the crop protection compound YRC 2894 with previous ageing in soil. Bayer AG Crop Protection Development. Laboratory Study Number M 121 0608-8. Study report date: 31-October-1995. Bayer Report Number 108307. DACO 8.2.4.3.2. DER completion date: not available. 13 pages.

PMRA 1044032 USEPA. Data Evaluation Record (MRID number 44927934) on the leaching of thiacloprid in soil. Study title: Leaching behaviour of the pesticidal active ingredient YRC 2894 after prior aging in soil (aged leaching) according to EPA requirements. Bayer AG Crop Protection Development. Laboratory Study Number M 121 0692-1. Study report date: 14-November-1995. Bayer Report Number 107936. DACO 8.2.4.3.2. DER completion date: not available. 12 pages.

PMRA 1044129 USEPA. Data Evaluation Record (MRID number 44927907) on the terrestrial field dissipation of thiacloprid in Wisconsin. Study title: Terrestrial field dissipation of YRC 2894 in Wisconsin soil, 1995. Agstat, A&L Great Lakes Laboratories Inc. and Bayer Corporation. Laboratory Study Number Y4022102. Study report date: 14-January-1999. Bayer Report Number 107900. DACO 8.3.2. DER completion date: not available. 18 pages.

PMRA 1044130 USEPA. Data Evaluation Record (MRID number 44927908) on the terrestrial field dissipation of thiacloprid. Study title: Terrestrial field dissipation of YRC 2894 in California soil, 1995. Bayer Research Farm and Bayer Research Park. Laboratory Study Number Y4022103. Study report date: 25-January-1999. Bayer Report Number 107901. DACO 8.3.2. DER completion date: not available. 17 pages.

PMRA 1044131 USEPA. Data Evaluation Record (MRID number 44927913) on the terrestrial field dissipation of thiacloprid. Study title: Terrestrial field dissipation of YRC 2894 in Georgia soil, 1996. Bayer Research Farm, Bayer Research Park and A&L Great Lakes Laboratories Inc. Laboratory Study Number Y4022101. Study report date: 8-February-1999. Bayer Report Number 108146. DACO 8.3.2. DER completion date: not available. 18 pages.

PMRA 1044132 USEPA. Data Evaluation Record (MRID number 44927930) on the terrestrial field dissipation of thiacloprid. Study title: Dissipation of YRC 2894 (480 SC) in soil under field conditions (France and Spain). Bayer AG Crop Protection Development. Study Numbers R502898 and R502928. Study report date: 22-January-1998. Bayer Report Number 108301. DACO 8.3.2. DER completion date: not available. 19 pages.

PMRA 1044133 USEPA. Data Evaluation Record (MRID number 44927931) on the terrestrial field dissipation of thiacloprid. Study title: Dissipation of YRC 2894 (480 SC) in soil under field conditions (France, Germany, Great Britain). Bayer AG Crop Protection Development. Study Numbers R502855, R502863, R502871, R505633, R505641 and R505668. Study report date: 14-November-1997. Bayer Report Number 108302. DACO 8.3.2. DER completion date: not available. 31 pages.

PMRA 1044158 USEPA. Data Evaluation Record (MRID number not available) on acute oral toxicity testing. Study title: YRC 2894 480 SC 05776/0071 Study for acute oral toxicity in rats. Bayer AG, Department of Toxicology. Laboratory Study Number T8061849. Study report date: 19-March-1998. Bayer Report Number 108668. DACO 9.7. DER completion date: not available. 3 pages.

6.0 Efficacy and Sustainability Assessment Division

6.1 Studies/Information Provided by Applicant/Registrant

PMRA 1044137 Calypso 480SC Insecticide (480 g a.i./L thiacloprid) for control of insects in pome fruit. A. Dorman, P. Bulman, and G. Zamecnik. 2004. 236 pages. DACO 10.0. Volume 1 of 1. Received 20 May 2005.

PMRA 1272178	Assessment of insecticides against first generation internal lepidoptera and plum curculio. L. Van Driel, D.J. Pree, M.K. Pogoda, J.A. Hermansen, S.A. Dick, and R.J. Wismer. 2005. 2 pages. DACO 10.2.3.3. Received 13 January 2006.

6.2 Published Information

Pest Management Regulatory Agency. 1999. Regulatory Directive DIR99-06, *Voluntary Pesticide Resistance-Management Labelling Based on Target Site/Mode of Action*. Ottawa, 23 pages.